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FINAL SUMMARY REPORT

DEPOT ACQUISITION MANAGEMENT AND ENGINEERING SUPPORT FOR CLOSE-IN WEAPON SYSTEM (CIWS) PHALANX MK 15 AND FCS MK 92/GUN MOUNT MK 75 OVERHAUL PROGRAMS

December 1980

Prepared for
MANAGER, SURFACE WEAPONS SYSTEMS MAINTENANCE BRANCH
NAVAL ORDNANCE STATION
INDIAN HEAD, MARYLAND
under Contract N00174-80-C-0241

ARINC RESEARCH CORPORATION

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This final report summarizes ARINC Research Corporation's work in support of the Navy'd Designated Overhaul Activity planning & acquisition efforts for the Close-In Weapon program. The work was performed from 18 April 1980 through 17 December 1980 for the Naval Ordnance Station, Indian Head, Md., under Tasks 1 through 5 of contract N00174-80-C-0241.

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Prepared for

Manager, Surface Weapons Systems Maintenance Branch
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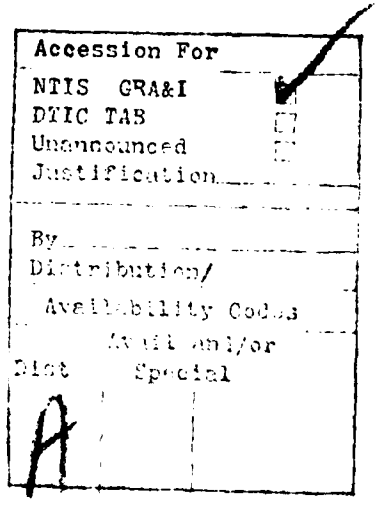
ABSTRACT

This final report summarizes ARINC Research Corporation's work in support of the Navy's Designated Overhaul Activity planning and acquisition efforts for the Close-In Weapon Program. The work was performed from 18 April 1980 through 17 December 1980 for the Naval Ordnance Station, Indian Head, Maryland, under Tasks 1 through 5 of Contract N00174-80-C-0241. Task 2 of this contract was deleted in its entirety by Contract Modification P00001 dated 8 September 1980.



CONTENTS

CONTENTS (continued)

CHAPTER ONE

INTRODUCTION

This report summarizes the work performed by ARINC Research Corporation from 18 April 1980 through 17 December 1980 to provide depot acquisition management and engineering support for overhaul programs for the Close-In Weapon System (CIWS) Phalanx Mk 15 and Fire Control System (FCS) Mk 92/Gun Mount Mk 75. Contract N00174-80-C-0241 specified five tasks for ARINC Research Corporation to perform in support of those programs. The original contract was subsequently modified to reduce the assignment to four tasks. The tasks were described in the contract as follows:

> Task 1: Update CIWS DLMF [Depot-Level Maintenance Facility] Management Guide. Review the current Preliminary Program Management Plan for the CIWS DLMF for adequacy and provide engineering and other technical support needed to rewrite the plan. Base rewrite upon the latest available information and participation in technical discussions concerning the CIWS DLMF management structure and responsibilities, management schedules and milestones, program reporting procedures, facility development planning, program resources management, and program assignment procedures for regular depot level maintenance, as well as CIWS management.
>
> Task 2: Develop an outline of the Specification for the CIWS DLMF Maintenance Management Reporting System. [Deleted by Contract Modification P00001 (8 September 1980.)
>
> Task 3: Failure Data Analysis Center Preliminary Management Plan. Assist in the formulation of a CIWS Failure Data Analysis Center by developing a preliminary Failure Data Analysis Center (FDAC) Management Plan encompassing the Center's responsibilities, operation and management. Specify input/output requirements for FDAC operation, interface with depot/design agent/in-service engineering agent and interface with other data and management reporting systems. Operational recommendations should include definition of general

requirements for data collection and analysis, and estimations of resources needed to satisfy these requirements. Items such as developmental planning and funding estimations should be addressed.

Task 4: Technical Repair Standard (TRS) Recommendations. Provide engineering support to develop a Technical Repair Standard specimen that is tailored to satisfy the requirements of organic repair/testing of CIWS CCAs [Circuit Card Assemblies] and modules. Considerations such as the requirements of MIL-STD-1604(OS), Technical and Maintenance Overhaul and Repair Standards, Preparation of and other accepted engineering standards are to be incorporated to meet Navy requirements; yet, tailoring to fulfill a single depot's needs vis-a-vis universal use of the TRSs is foremost.

Task 5: Engineering, Management, and Logistic Support. Provide continuing engineering, management, and logistic support as required to assist NOSIH in the development, implementation, and operation of DLMF acquisition management program for the CIWS, for FCS Mk 92, and Gun Mount Mk 75. Support provided under this task is expected to be in one or more of the following areas: repairables assessment, resource requirements planning and assessments, TRS development, ECP [Engineering Change Proposal] evaluation, documentation development and review, information system/data base development and review, sparing requirements assessment, support equipment studies, and system reliability studies.

The contract resulted in ARINC Research supporting the CIWS maintenance manager's planning for initiating the CIWS designated overhaul activity (DOA). Throughout this eight-month effort ARINC Research was involved almost every day with the principal activities responsible for development of the DOA. This support was directed toward ensuring that the updated CIWS Maintenance Management Plan was coordinated with the responsible activities and represented a workable plan. Our independent management and engineering support was primarily concerned with developing the TRS Specification Guide and preparing a preliminary failure data analysis center (FDAC) management plan.

Chapter Two of this report provides a brief summary of the work accomplished under each task, the conclusions reached as a result of the effort, and any recommendations relevant to conclusions reached. Appendixes A, B, and C are formal reports of the results of the efforts of Tasks 1, 3, and 4, respectively. Appendix D lists abbreviations and acronyms commonly used in the CIWS Program.

CHAPTER TWO

TASK DESCRIPTIONS AND FINDINGS

This chapter describes the work performed under each of the first five tasks in Contract N00174-80-C-241. The objective of this contract was to help the Naval Ordnance Station Indian Head (NOSIH) provide the Naval Sea Systems Command Gun System Support Office (NAVSEA-62YG) with plans for the acquisition and development of an internal Navy depot-level maintenance facility (DLMF) to support CIWS throughout its life cycle.

The specific tasks and findings represent follow-on efforts to Contract N00174-79-C-0330, which initiated ARINC Research's engineering and management support of the CIWS Phalanx Mk 15 overhaul program. We continued research and analysis of CIWS documents and events, visited Navy facilities, and interviewed Navy and contractor personnel. Section 2.7 reports important trips and meetings.

2.1 TASK 1: UPDATE CIWS DLMF PROGRAM MANAGEMENT GUIDE

Under Task 1, ARINC Research was required to prepare an updated management guide for use at the program manager's level. The process was planned to incorporate user comments on the Preliminary Management Guide and couple those with any additional program developments that affect CIWS life-cycle support.

2.1.1 Task 1 Activities and Results

Under Task 1, our engineers performed the following activities:

- With representatives of Code 5033 from the Naval Ordnance Station Indian Head (NOSIH), we visited Naval Ordnance Station Louisville (NOSL) and Naval Sea Systems Command (NAVSEA) representatives to obtain comments regarding the Preliminary Management Guide.
- We revised the preliminary milestone plan for development of the CIWS depot overhaul facility to accommodate program changes, completions, slippages, and additions.
- We revised the preliminary program-level management structure for the depot overhaul program to accommodate Naval Sea Systems Command (NAVSEASYSCOM) decisions and reorganizations.

- We obtained additional revised reference documents to incorporate into the overall management plan formulation.

The Preliminary Management Plan was designed as a working document to guide personnel concerned with the development and support of the CIWS depot-level repair program. It included program objectives, policies, constraints, organizational structures, relationships, assignments, and descriptions of the procedures for information reporting, program assessment, and resource management.

During the period of gathering updated material it became clear that the management of the Navy's candidate CIWS depot had objections to much of the preliminary plan and that implementing the plan and policies would be difficult. Even though the plan was written within the guidelines established by NAVSEASYSCOM, we discovered that several concepts and assignments illustrated in the original plan would require significant compromise to bring about a harmonious depot operation. Additionally, there were interests not within the control of NAVSEA-62YG that preferred to assume that the in-house Navy depot facility duplicated established repairables facilities, both private and Government operated.

During several meetings held to resolve these issues, NAVSEA-62YG and NOSIH-5033 representatives agreed that the plan should be retitled and restructured to resolve differences and to eliminate some of the obstructions to establishment of the Navy's depot-level overhaul facility. Consequently, the revised "Preliminary Management Plan for Close-In Weapon Systems Mk 15 Depot Level Maintenance Facility" is now entitled "Maintenance Management Plan for Close-In Weapon System Mk 15." The retitled document is very similar in scope to the original plan, but it has been revised to emphasize the distinctions between the limited scope of the contractor-operated interim Depot Level Maintenance Facility and the Navy's planned DOA. The revised plan appears in Appendix A of this document.

2.1.2 Task 1 Conclusions

On the basis of the work performed under Task 1 and considering the reactions to the management structures and organizational assignments presented in the original management plan, we have reached the following conclusions:

- Varying degrees of headquarter's influence will be necessary to implement the CIWS Maintenance Management Plan as new field activities are introduced to the CIWS maintenance and overhaul programs.
- Early promulgation of the plan (to allow timely comments by reviewers) will permit the resolution of unforeseen problems before organic depot operation begins.

2.1.3 Task 1 Recommendations

The following recommendations are based on the above conclusions:

- The Maintenance Management Plan for CIWS should be expeditiously distributed for review, requesting comments to be returned within a specified period to permit incorporation of appropriate material by late fiscal 1981.
- The document should be distributed to key users early in fiscal 1982 to assure implementing activities are indoctrinated before the organic overhaul activity begins.

2.2 TASK 2: DEVELOP AN OUTLINE OF THE SPECIFICATION FOR THE CIWS DLMF MAINTENANCE REPORTING SYSTEM

Under Task 2, ARINC Research was required to develop a system-level Maintenance Management Reporting System (MMRS) specification outline to guide MMRS specification development. The outline was to list requirements for data collection, storage, processing, and reporting; define software, data bases, forms, data products, and documentation requirements; and describe interface requirements for users and system maintenance.

2.2.1 Task 2 Activities and Results

Our activities under Task 2 included the following:

- We visited with NAVSEASYSCOM and NOSIH representatives to obtain their comments regarding the preliminary MMRS description.
- Initial revisions were made to develop a revised MMRS specification listing the preliminary requirements for data collection, storage, processing, and reporting; define software, data bases, forms, data products, and documentation requirements; and describe interface requirements between participating activities.
- During subsequent meetings with NAVSEASYSCOM and NOSIH representatives, we learned that a similar effort was under development at NOSL.

Effort on the CIWS MMRS specification outline was deleted from the contract by a modification (P00001) because of developments that became evident subsequent to the initiation of the contractual effort. The effort accomplished before the task was deleted was directed at defining priority information required by the CIWS maintenance managers to support the Navy's overhaul capability development and the CIWS repair program. The description of the MMRS developed by ARINC Research under Contract N00174-79-C0330 provided the baseline for the specification outline development.

The primary effort centered on developing a specification to describe necessary MMRS support. The following support categories, as reported in the MMRS description, were all found to be necessary and supportable by the MMRS:

- Cost accounting and budget preparation
- Equipment condition monitoring
- Resource utilization planning and monitoring
- Maintenance effectiveness assessment
- Overhaul planning and monitoring
- Inventory accounting

The specification outline identified available information systems capable of providing data to the MMRS. All data were analyzed to determine their applicability to the MMRS. MMRS needs were then compared with available, applicable data to determine deficiencies. The analyses were stopped at this point.

It was learned that NAVSEA was already receiving substantial automated information from another source supporting CIWS budgetary planning and inventory accounting. This source has expanded its maintenance information system (MIS) support of the CIWS Maintenance Management Program through increased efforts with NAVSEASYSCOM and NOSL. As a result of the existing MIS activity, it was determined that ARINC Research's involvement in this task would be reduced in scope to advisory support as appears in modified Task 5. The foreclosure of Task 2 was timely and cost-effective, as the time expended developing the specification outline ultimately contributed to development of the FDAC Management Plan (Task 3).

2.2.2 Task 2 Conclusions and Recommendations

There are no conclusions or recommendations offered for Task 2.

2.3 TASK 3: FAILURE DATA ANALYSIS CENTER PRELIMINARY MANAGEMENT PLAN

Under Task 3, ARINC Research was required to develop a preliminary management plan for the proposed CIWS failure data analysis center. This plan provides CIWS program management with initial guidance required to establish a comprehensive failure data analysis capability addressing required data collection and analysis, organizational structure, and resources. An overriding consideration during preparation of the FDAC management plan was the requirement to develop the plan before identifying the FDAC activity. The preliminary management plan emphasize the development of an autonomous failure data analysis center, solely responsible for analyzing CIWS failure data.

2.3.1 Task 3 Activities and Results

Our activities under Task 3 included the following:

- We discussed with NAVSEA and NOSIH representatives the role a failure data analysis center should serve to support CIWS maintenance managers.
- We identified existing available Navy information sources and data products with the potential to support CIWS failure data analysis.
- We researched similar failure data analysis efforts for ongoing Navy programs, e.g., Basic Point Defense Surface Missile System (BPDSMS), Mk 86 Gun Fire Control System (GFCS), and Mk 46 Torpedo.
- We identified the analysis center's data processing requirements for failure data analysis.
- We developed general organizational requirements and operational procedures for the FDAC.
- In general terms, we defined responsibilities and resources required to support the CIWS failure data analysis center.
- We developed a description of the FDAC within the CIWS Program.

The preliminary management plan for the CIWS failure data analysis center emphasized support by an autonomous activity. Research of documentation and similar Navy failure data analysis efforts (such as BPDSMS, Mk 86 GFCS, Mk 46 Torpedo) reveals that a failure data analysis center provides useful input to the life-cycle maintenance support of a system when it operates independently of other activities within the program and is unconstrained by conflicting responsibilities of program management.

The preliminary failure data analysis center management plan is a working document that can be developed into the final FDAC management plan. The plan is intended to complement the Maintenance Management Plan for Close-In Weapons System Mk 15. It will serve as the guiding document in the area of failure data analysis support.

The plan is reproduced in Appendix B. It includes detailed information that complies with requirements of the Maintenance Management Plan's work breakdown structure elements 3021 through 3024. It also includes detailed information reflecting current program status and planning. Additional details will be provided by NOSIH as maintenance support for the CIWS Program develops.

2.3.2 Task 3 Conclusions

As a result of the work accomplished and reviews held, we have concluded that a failure data analysis center would enhance the CIWS Program. It is in the program's best interests to establish a center that has autonomy within the program and does not have conflicting objectives. The plan presented provides CIWS program management with the guidance to establish

a failure data analysis center; the FDAC will best serve the program if its planning and implementation are coordinated with the start of the DOA repair capability. It is therefore important to make the decisions concerning FDAC placement, logistical requirements, project objectives, and milestones before fiscal 1982.

2.3.3 Task 3 Recommendations

The following recommendations are offered as a result of the Task 3 conclusions:

- NAVSEA-62YD (Program Office) and NAVSEA-62YG (GWS Maintenance Manager) should jointly agree to establish a CIWS FDAC under the cognizance of the CIWS Maintenance Manager.
- The FDAC should be placed at an activity that can carry out tasking independent of other assigned program responsibilities or activities.
- The FDAC should be planned and initiated to support the phase-in of the DOA repair capability at NOS Louisville.

2.4 TASK 4: TECHNICAL REPAIR STANDARD (TRS) RECOMMENDATIONS

The purpose of Task 4 was to develop a technical repair standard specimen tailored to fulfill the requirements for use of TRSs at the designated overhaul activity, meet the requirements of Military Standard 1604(OS) and other accepted engineering standards, and, as possible, meet a single depot's needs rather than those of all depots. We interpreted this task as the requirement to develop the technical specification for preparation of the "minimally acceptable" TRS. Once prepared, these TRSs will be affordable, completely useful, and in compliance with reference directives.

2.4.1 Task 4 Activities and Results

ARINC Research activities under Task 4 included the following:

- We collected and reviewed reference documents related to preparation of TRSs, including these three:
  - Military Standard 1604(OS), Preparation of Technical and Maintenance Overhaul and Repair Standards
  - MIL-T-24424 (SHIPS), Technical/Maintenance Overhaul and Repair Standards
  - Technical Specification 4710-003, [PERA (CRUDES)], Preparation of Surface Ship Technical Repair Standards
- We collected and reviewed the candidate DOA's TRS examples as well as those TRSs used by similar Navy modular and electronic repair facilities.

- We interviewed NOSL production controller and shop management personnel to determine the usefulness of including extensive reference material.
- We prepared preliminary TRS outline and example pages for discussion with NOSIH-5033 representatives.
- We reviewed a draft specification with NOSIH and NAVSEA representatives and incorporated their special requirements.
- We produced a final technical specification for TRS preparation for CIWS repairables.

The technical specification that was developed provides CIWS program management with specific guidelines for preparation of uniform CIWS TRSs. Initially the task required preparation of a specimen TRS; however, research indicated that insufficient data existed to document the shop procedures or quality assurance procedures to be employed at the DOA. The data shortage and the significant amount of work remaining to develop the DOA's initial repair capability changed the direction of this effort. The NOSIH contracting officer's technical representative (COTR) agreed that this task should be interpreted as a requirement to develop the technical specification for TRS preparation. Once the necessary test equipment, personnel, and facilities are in place at the DOA, TRS preparation will begin, using the technical specification as a guide. The technical specification prepared as a result of this task is reproduced in Appendix C.

2.4.2 Task 4 Conclusions

As a result of our work and reviews, we have concluded that the final technical specification for the preparation of CIWS TRSs can be readily adapted to the various types of equipments to be repaired by the CIWS DOA.

2.4.3 Task 4 Recommendations

To permit timely development of TRSs (in accordance with the TRS specification) for the CIWS DOA, we recommend that the TRS specification be delivered to the overhaul activity at the earliest possible date.

2.5 TASK 5: ENGINEERING, MANAGEMENT, AND LOGISTIC SUPPORT

Under Task 5, ARINC Research was required to provide continuing engineering, management, and logistic support planning in the general areas of repairables assessment and management, facility and overhaul requirements, resources and sparing requirements, TRS and other documentation development and review, and support equipment and system reliability studies. The task was modified during the contract period to incorporate advisory support as required in the development of the CIWS MIS.

2.5.1 Task 5 Activities and Results

ARINC Research activities under Task 5 included the following:

- We participated in all CIWS depot acquisition planning and progress meetings at NOSIH, NOSL, NAVSEASYSCOM, and ARINC Research.
- We participated in preparation of the NAVSEASYSCOM's A-76 submittal letter (Industrial Facility Establishment) to Naval Material Command Industrial Resources Detachment, Philadelphia, regarding designation of NOS Louisville as the CIWS DOA.
- We prepared the initial draft request to design managerial responsibility for the failure data analysis center to NAVSEA-62YG.
- We prepared draft review comments regarding CIWS ILSP-025-4 Rev B for submission to NOS Louisville, and put the comments in final form after critique with NAVSEA-62YGE and NOSIH-5033.

The following activities were previously reported (ARINC Research Periodic Status Report 1678-01-SR-2258).

- We assisted NOSIH, NAVSEASYSCOM, and NOSL in developing the briefing to MISG-C and U.S. Air Force representatives concerning CIWS depot manpower, facilities, and workload projections presented at General Dynamics, Pomona. The purpose of this effort was to persuade Chief of Naval Material (CHNAVMAT) to permit NAVSEASYSCOM to determine where the CIWS depot would be established.
- We continued to review and update key items that must be addressed in the development of the CIWS depot facility at NOSL with NAVSEASYSCOM and NOSIH representatives.
- We participated in two quarterly and four monthly progress meetings with NAVSEASYSCOM, NOSIH, and NOSL representatives to consider and resolve developing issues regarding the organizational structure, assignments, and responsibilities of several field activities scheduled to support depot overhaul functions.
- We assisted in reviewing several planned approaches for early CIWS equipment failure data collection and analysis to assure a viable program was being established for improvement of system reliability and maintainability.
- We reviewed a comparable, high-volume repairables program (FCS Mk 86 - NWSC Crane) to assist in formulating plans for documenting repair activity at the CIWS depot. This review was conducted to gain insight regarding lessons learned in the acquisition of automatic test equipment, software, and associated hardware, and to solve problems associated with receipt, packaging, shipping, and inventory control of electronic equipments.
- We assisted in development of the CIWS depot "New Start" letter for submittal to Assistant Secretary of the Navy, Industrial and

Logistics [ASN (I&L)]. The purpose of the letter was to formally announce NAVSEASYSCOM's plan to establish a Navy depot.

- We gathered additional documents relating to reliability data center management, technical repair standards, and quality assurance procedures to support the Navy in its development of CIWS organic depot overhaul management alternatives.
- We reviewed and modified CIWS depot maintenance program major milestones to determine accomplishments, slippages, and additions necessary to update depot maintenance support.

2.5.2 Task 5 Conclusions

On the basis of work performed under Task 5, we reached the following conclusions:

- Because of continuing CIWS production and delivery schedule changes and delays, the DOA workload composition will not fully materialize as initially projected. In addition, the interim repair facility at GD, Pomona, may have difficulty in meeting fleet demands for certain categories of repaired modules. These two situations could affect depot planning for the exact order of test equipment installation.
- Our heavy concentration on CIWS engineering, management, and logistic support has almost totally negated any latitude to concurrently research and review FCS Mk 92 and Gun Mount Mk 75 overhaul programs.
- Substantial and continuing management attention and support is required over the next 2 to 3 years to establish the necessary miniature and micro-miniature electronic repair capacity at the designated DOA.
- Continuing maintenance management support to NOSL will be required to establish a depot repair capability as specified in CIWS ILSP 025-4 Rev. A.

2.5.3 Task 5 Recommendations

The following recommendations are based on the above conclusions:

- NAVSEA should continue to sponsor regular progress reviews to ensure establishment of the depot according to schedule.
- NOSIH should provide direct support to NAVSEA-62YGE in areas specified in Appendix A, Section 3. Additionally, NOSIH should provide indirect support to depot establishment by developing the depot validation plan and repair standards as appropriate.
- NAVSEA should review the sequence of organic depot capability phase-in to assure that the most needed repair capability (to support fleet demands) appropriately influences the priority of automatic test equipment installation. NOSL should install the most needed equipment as early as feasible.

2.6 TRAVEL AND MEETING SUMMARY

The following trips were taken and meetings attended by ARINC Research in support of task efforts under Contract N001/4-79-C-0241:

- 13 May 1980: Held initial CIWS support contract meeting at NOSIH. Discussed general approach to project work.
- 9 June 1980: Joined NAVSEA-62YGE at NOSIH to discuss apparent redundancy of effort in MIS development.
- 7-9 July 1980: Attended quarterly CIWS progress meeting at NOSL.
- 22 July 1980: Held critique of CIWS quarterly meeting at NOSIH and discussed NOSL's "New Start" presentation.
- 1 August 1980: Visited NOSIH to discuss restructured Maintenance Management Plan.
- 18 August 1980: Delivered and critiqued periodic status report.
- 23 September 1980: Presented contract work progress briefing at ARINC Research for NOSIH and NAVSEA sponsor and discussed depot validation requirements.
- 23 October 1980: Discussed preliminary TRS specification development with NOSIH and NAVSEA.
- 6 November 1980: Visited NOSIH to discuss failure data analysis center issue paper with NAVSEA-62YGE.
- 12-14 November 1980: Attended quarterly CIWS progress review with NOSIH at NOSL.
- 25 November 1980: Delivered to and critiqued with NOSIH the TRS specification. Delivered draft Maintenance Management Plan for review.
- 1 December 1980: Visited NAVSEA-62YGE to review the major milestones chart of the Maintenance Management Plan prior to final printing.
- 17 December 1980: Attended NAVSEA-62YGE meeting to discuss CIWS supply support transition and depot validation plans.

APPENDIX A

MAINTENANCE MANAGEMENT PLAN FOR CLOSE-IN WEAPON SYSTEM (CIWS) MK 15

The Maintenance Management Plan for the Close-In Weapon System (CIWS) describes the policy and procedures for the establishment and operation of the CIWS depot-level repair program. Recent decisions affecting CIWS maintenance have resulted in the requirement to update the preliminary instruction. The revised version of the management plan is presented herein.

MAINTENANCE MANAGEMENT PLAN
FOR
CLOSE-IN WEAPON SYSTEM (CIWS) MK 15

December 1980

Prepared for

Director, Gun System Engineering Division
Naval Ordnance Station
Indian Head, Maryland

under Contract N00174-80-C-0241

by

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ABSTRACT

The Designated Overhaul Activity (DOA) for the Close-in Weapon System (CIWS) Mk 15 (PHALANX) is being designed to provide repaired and refabricated system modules to the operating forces, and to perform complete system overhauls when necessary in the CIWS life cycle. Supporting the development of the DOA are the PHALANX System Integrated Logistics Support Plan (ILSP-025-4 Rev. A) and this document. This preliminary management plan is intended to provide sufficient advance information to guide personnel concerned with the establishment and initial planning for the operation of the CIWS depot-level repair program. It documents initial program objectives, policies, relationships, constraints, assignments, and organizational structure. It provides an initial description of procedures planned for reporting, program assessment, and program resources management.

CONTENTS

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

The Close-In Weapon System (CIWS) Mk 15 (PHALANX) is the product of an industry search for a lightweight gun system that would provide ship defense against low-altitude, high-speed, short-range, closing threats. In 1968 the General Dynamics Corporation, Pomona Division, proposed the PHALANX weapon system to accomplish this task. The Naval Ordnance System Command studied the PHALANX concept and in 1969 requested General Dynamics to produce an advanced development model.

Late in 1970 the PHALANX system entered the engineering development phase. Operational testing was conducted at the Pacific Missile Range in 1973 on one of two prototype systems developed during this phase. Testing against various targets continued into early 1976.

In 1974 three operational suitability models were ordered; however, only two of these prototypes were built, because of Congressional budget action. One model, in its final development configuration, underwent operational evaluation in 1976 and 1977.

The second prototype was used to test reliability and maintainability improvements for incorporation into production equipments. Procurement of production equipments commenced in FY 1978 and is planned to continue through FY 1985. The first production item was delivered in July 1979, with completion of delivery scheduled for FY 1986. A total production run of 470 systems is planned, including trainers and foreign military sales units.

Logistics support planning for CIWS is based on the system's capability for fault isolation to the module or circuit card assembly level. This has led to the definition of a maintenance strategy requiring only organizational and depot maintenance capabilities. A final decision concerning requirements for the establishment of in-service intermediate-level maintenance support for CIWS has been deferred until April 1982.* Under the present plan, organizational-level maintenance will consist of the replacement of defective modules, circuit cards, and assemblies; defective items will be either thrown away or returned to the Designated Overhaul Activity (DOA) for repair. Throwaway and repair decisions are to be made in accordance with the level-of-repair analysis conducted by General Dynamics during development and as approved by the CIWS project manager.

The CIWS gun MOUNT and the prototype weapon (Mk 15) will be replaced as whole units at the organizational level and returned to established Designated [illegible] for repair and overhaul as needed. All other repairable items [illegible] organizational level will be returned to the designated [illegible] for overhaul. *Interim CIWS Depot-Level* Maintenance [illegible] planned for FY 1982 through 1985 will be performed by General Dynamics, Pomona, California. Planning for the development of the Navy DOA for CIWS has commenced under the cognizance of the [illegible] (NAVSEA-03Y6). This Navy DOA is expected to begin operations in a limited capacity in FY 1982 and phase into full CIWS support by FY 1985. Table 1-1 shows the volume of items expected to be processed through the CIWS DOA during this period. This table categorizes items as repair-beyond-base repairables, depot refabrications to replace discarded or destroyed items, and repairs and refabrications subcontracted to vendors through the DOA.

CIWS items requiring major overhaul or replacement, including 2J-cognizant-coded components, will be identified by means of a process like that used in the Gun Weapon System Replacement Program's material condition

*ILSP-02?-4 Rev. A.

Table 1-1. EXPECTED VOLUMES OF DOA-PROCESSED CIWS ITEMS*

Category	Volumes by Fiscal Year				
	1982	1983	1984	1985	1986
DOA Repairables	2,438	4,500	7,063	10,188	13,063
DOA Refabrications	1,268	2,340	3,673	5,298	6,793
Vendor-Subcontracted Items	194	360	564	814	1,044
Totals	3,900	7,200	11,300	16,300	20,900

*Dependent on follow-on system procurement levels.

reporting, which is also managed by NAVSEA-62YG. Early estimates indicate that major system refurbishments will be required at six-year intervals. It is expected that requirements for this type of overhaul will begin to be added to the established Navy DOA in about FY 1986.

1.2 OBJECTIVES

The objective of this plan is to provide a structured management system that will furnish guidance in meeting material, funding, and logistic support requirements for CIWS depot-level-maintained repairables.

1.3 SCOPE

This plan documents the management structure and responsibility assignments defined by NAVSEA to support the acquisition and use of the CIWS DOA. Management structure and responsibilities within the DOA concerned strictly with internal operations are purposely excluded from this plan and are being developed by the Naval Ordnance Station, Louisville. However, this plan does address overall DOA responsibilities and requirements and the general external management environment in which these must be met. Specific relationships have been established within the Navy Department to coordinate program functions, assignments, and responsibilities, and to ensure maximum efficiency and cooperation of the CIWS acquisition manager, the CIWS in-service support manager, the DOA manager, and other Navy organizations; they

are defined in the following chapters as they are presently functioning. Additional information concerning new or changed participants or responsibilities will be incorporated when it becomes available.

A milestone chart depicting scheduled developments within the CIWS maintenance program is provided in the Appendix.

CHAPTER TWO

DOA PROGRAM FUNCTIONS, ASSIGNMENTS, AND RESPONSIBILITIES

2.1 INTRODUCTION

The replaceable-module-maintenance concept for CIWS relies heavily on shore repair facilities. During the early part of the fleet introduction period (FY 1980 and 1981) the Navy will depend entirely on contractor support to provide replacements for failed modules, circuit-card assemblies, and electromechanical assemblies from the Interim Depot-Level Maintenance Facility (IDLMF) at General Dynamics, Pomona, California.

Initial planning called for the incorporation of this repair or replacement function into the Navy's industrial repair capability in 1986. However, the impact of related programs, e.g., DDEOC and LO-MIX, involving other Navy planning for long-range organic depot capability, made it necessary to reconsider the earlier plan.

Early in 1979 representatives of the CIWS acquisition and maintenance-oriented offices met informally at NAVSEASYSCOM to discuss the feasibility of developing this repair capability by 1982. Decisions reached in several follow-on meetings established an earlier capability date and also established certain parameters for functional responsibility and intracommand relationships. The principal decision resulting from the several meetings was that NAVSEA-62YG would formulate plans for an organic DOA to be operational in late 1981. Other considerations, including responsibilities and assignments, are covered in the following sections.

2.2 HEADQUARTERS SUPPORT

Management responsibility for the Close-In Weapon System is vested in the Commander, Naval Sea Systems Command. The CIWS Program Office

(NAVSEA-62YD) and Gun Systems Support Office (NAVSEA-62YG) are the designated management agents for achieving CIWS repairables support to the operating forces. Both principals report to the Director, Surface Gun Weapon Systems Subgroup (NAVSEA-62Y). Figure 2-1 depicts this organizational structure. By previous agreement, the establishment and operation of an IDLMF is under the control of NAVSEA-62YD. The planning, establishment, and operation of the organic DOA is under the cognizance of NAVSEA-62YG, as will be the planning for development of major overhaul capability. Because the IDLMF is of limited duration and its operation is contractually specified by NAVSEA-62YD and NAVORDSTA, Louisville, this document does not cover the management of that facility.

Table 2-1 lists the specified responsibilities of headquarters level Navy commands, including the program support they will provide to organic DOA management and funding. Specific field activity functions are described in the Work Breakdown Structure discussed in Chapter Three.

2.3 SUPPORT ACTIVITIES

Planning for the establishment and management of the organic DOA will follow precedent insofar as field activity capability and capacity permit. That is, NAVSEA-62YG intends that Naval Ordnance Station, Indian Head (NOSIH), will provide technical assistance and maintenance management support to formulate coordination, reporting, and analysis planning as tasked; Naval Ordnance Station, Louisville (NOSL), will provide industrial site planning, operational support, industrial engineering support, and management support as tasked; and activities such as Naval Sea System Support Offices (NAVSEACENs) will provide field support engineering and waterfront liaison as tasked. Other functional support planning, such as that normally provided by the Ships Parts Control Center (SPCC), Naval Ship Weapon System Engineering Station (NSWSES), and contractors, will be solicited in accordance with established practice.

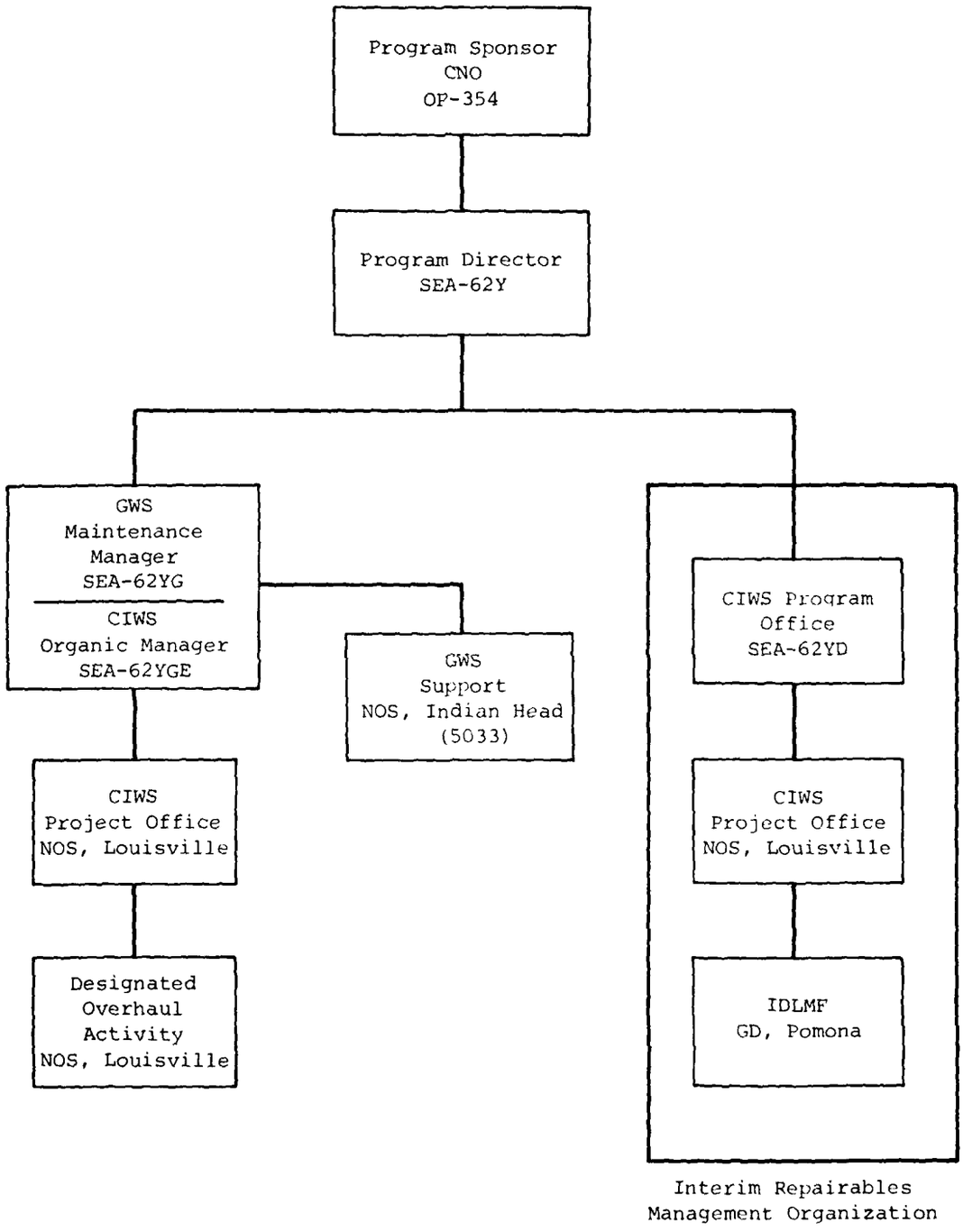

Figure 2-1. CIWS MAINTENANCE MANAGEMENT ORGANIZATION

Table 2-1. RESPONSIBILITIES OF HEADQUARTERS LEVEL COMMANDS

Function	COMNAVSEASYSCOM	CHNAVMAT/CNO
1. Program Management	Develop a detailed maintenance plan for management policy and implementation to support the CIWS repairables program. Identify and quantify repairables requirements. Establish standards of repair and the requirements for certification of those standards. Select the Navy in-house DOA. Task field activities and contractors to implement the CIWS Maintenance Management program. Initiate major overhaul capability planning.	Establish Navy policy directives and updates, and support and coordinate inter- and intra-service efforts that may be required to effect operation of CIWS DOA. Review and approve plans.
2. Budget and Funding	Submit budget requirements to CNO via CHNAVMAT. Provide funding to supporting activities (e.g., NOSIH, NOSL, SPCC) to implement tasking.	Coordinate and submit budget in support of CIWS repairables program. Provide resources for execution of program.

CHAPTER THREE

CIWS MAINTENANCE PROGRAM

3.1 PROGRAM DESCRIPTION

The development of the Close-In Weapon System depot-level repair capability is being undertaken in two phases. The two-phased effort will result in the development of a single Navy designated overhaul activity responsible for the depot-level maintenance for CIWS modules and systems. Phase I consists of establishing an initial capability to diagnose, repair, and test replaceable modules, circuit-card assemblies, and electromechanical assemblies. In addition, Phase I will be expanded to include a manufacturing capability of replacing worn-out or discarded modules when CIWS production has been completed and the contractor can no longer manufacture spare modules.

Phase II will consist of further expanding the facility for overhauling the major equipments of the CIWS and restoring them to Class A condition, i.e., refurbishment of the electronic enclosure, barbette assembly, local control panel, remote control panel, mount-and-train drive assembly, gun assembly, and fire-control radar/servo assembly. Completion of Phase II will fully establish a central, total-capability CIWS Designated Overhaul Activity, which will include all functions previously performed in the Phase I operation.

3.2 WORK BREAKDOWN STRUCTURE

The Work Breakdown Structure (WBS) for management of the CIWS Designated Overhaul Activity Program is shown in Figure 3-1. The format of this WBS conforms to MIL-STD-881A, Work Breakdown Structures for Defense Material Items. This WBS will be used for coordinating, tasking, funding, and

reporting program activity. The WBS is task-oriented by elements and is currently limited to three levels in order to highlight management echelons. The three levels are as follows:

- Primary program authority and responsibility to support CIWS field activity restoration and repair requirements to fulfill fleet support requirements
- Major areas of activity required by Level 1 management to implement the maintenance program
- Task areas that will be accomplished by or through Level 2 activity

The WBS may be expanded to include lower levels of detail as the need arises during DOA development.

Elements of the CIWS Maintenance Management Plan WBS are established to create a project organization in which tasks are assigned to the appropriate agencies. Responsibility and authority to execute tasks are inherent in the assignment. The various organizations are integrated into the program structure as each specific task is integrated into the project. Completion of some Level 3 elements is contingent upon completion of other elements; these lines of interactivity of support are delineated in Chapter Five, Program Coordination.

The elements within the WBS for the CIWS depot-level maintenance program are defined in Table 3-1. The definitions in this table identify the specific functional requirements for each element. Each element represents a general area of concern assigned to one of the three major activities involved in the CIWS depot-level maintenance program. Some additions and refinements of elements are expected to be made as the CIWS maintenance program matures.

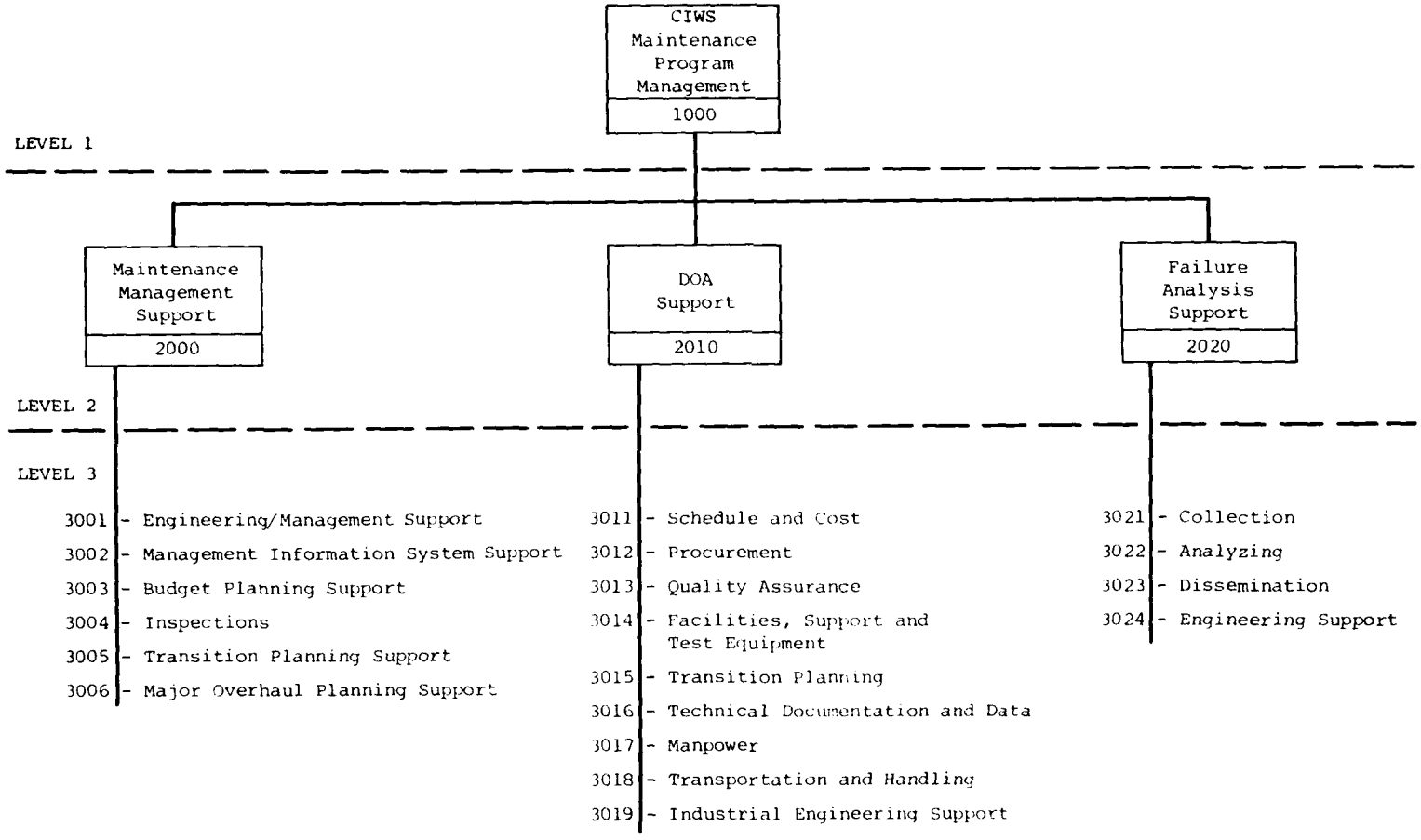

Figure 3-1. ELEMENTS OF CIWS MAINTENANCE PROGRAM WORK BREAKDOWN STRUCTURE

Table 3-1. DEFINITION OF ELEMENTS

Element 1000, Program Management. Includes the total management and execution of the CIWS maintenance management plan, obtainment and control of resources, and compliance with higher authority policy and directives. Also includes approval of Level 2 and 3 organization, funding, logistic support, and site management functions required for satisfactory program implementation.

Element 2000, Maintenance Management Support. Includes engineering and management support in developing depot planning data, performing technical reviews and analysis, preparing management aids to depict program status, participating in site development and inspection, planning for transition from private industry to the organic facility, developing production monitoring systems to prepare budget planning data, and assessing overall program effectiveness. Also includes the planning effort necessary to develop the CIWS major overhaul capability, attendance at related conferences, and review of pertinent documentation and schedules to assure that CIWS depot efforts support overall Navy maintenance planning.

Element 2010, DOA Support. Includes developing, transition to, and maintaining an organic industrial facility that will repair or refabricate CIWS equipments (except the M61A1 gun and KSR 35 teletypewriter). Also includes scheduling workload, estimating cost-of-repair, procuring repair parts, assuring hardware quality, modifying facilities, doing industrial engineering, procuring tooling and test equipment, handling and packaging, maintaining adequate work force, and providing required repair-cycle data to program management. Includes all aspects of CIWS maintenance engineering support related to assuring that the depot repair/refurbishment process fulfills fleet requirements for repaired equipments.

Element 2020, Failure Analysis Support. Includes engineering and management support to Program Management (1000) by providing information that

(continued)

Table 3-1. (continued)

Element 2020 (continued)

will help prevent or limit repetitive equipment failures, to make continuous reliability assessment of readiness achievement with respect to CIWS system specifications, and to assess maintainability at both the depot and the fleet levels. Also includes the function of developing communication lines and a reporting system that guides the efforts of the in-service engineering and maintenance engineering agents in the tasks required for the most efficient development of improvements to achieve specified or enhanced reliability, maintainability, and availability (operational readiness) and to reduce life-cycle costs.

Element 3001, Engineering/Management Support. Consists of the planning and implementation of a maintenance program giving consideration to such items as repair parts, special documentation, services, and other items that are required to support the depot repair and restoration program, e.g., repair-standard requirements, program plan, depot validation plan, and "New Start" documentation/Depot Maintenance Interservice Support Agreement (DMISA) establishment.

Element 3002, Management Information System Support. Consists of monitoring design, development, and implementation of an information system that will provide Level 1 management (1000) with the insight necessary to obtain resources adequate for fulfilling fleet demand for repaired/refurbished CIWS modules and equipments; with a comprehensive picture of production-related information, e.g., workload summary, average turnaround time, cost per repair by unit type, and backlog; and with required data to failure-data analysis projects.

Element 3003, Budget Planning Support. Includes assisting CIWS Maintenance Program Management (1000) in the preparation of budget submissions by planning for outyear depot-level rework, modernization and refurbishment efforts, and developing justification and data for budget reviews. Also includes consolidating resource estimates from all Level 2 and lower

(continued)

Table 3-1. (continued)

Element 3003 (continued)

sources and, in consultation with Program Management, resolving inconsistencies into an approved schedule for utilization of resources; acting as planning consultant to all contributing organizations; and assisting in preparation of work requests, project orders, and other technical tasking documentation on a schedule commensurate with funding allocations.

Element 3004, Inspections. Includes monitoring the restoration or repair of equipments, units, and modules to ensure accuracy and adequacy of repair standards, testing, and quality procedures through first-time validation. Also includes ensuring that engineering changes in equipments are incorporated into repair and quality documentation; and participating in overhaul site visits and depot validation as required; managing and implementing the Material Condition Review inspection program; and assuring that each system receives the requisite inspections during the ship's operating cycle in order that each overhaul may be properly scheduled.

Element 3005, Transition Planning Support. Consists of supporting the planning and scheduling for phase-down of the Interim Depot-Level Maintenance Facility (contractor) as organic depot-level capability is established (3013). This task includes reviewing in-house facility capability and capacity; reviewing plans for assimilation of Navy-owned residual repair facility equipments that could be used for organic capacity expansion, and making recommendations to support transition of those equipments; reviewing information packages required for notifying users and stock-points of transition schedules; and reviewing requirements for retention of contractor support beyond transition to the in-house DOA.

Element 3006, Major Overhaul Planning Support. Includes determining the requirements of major equipment overhaul capability consistent with

(continued)

Table 3-1. (continued)

Element 3006 (continued)

ordnance refurbishment processes established for other gun systems. Also includes proposing a single designated overhaul activity to avoid conflict with other rework programs, making maximum use of existing resources, determining most economical processes (total system induction vs. major assembly overhaul), describing and scheduling facility establishment, developing tooling and test equipment requirements, conducting inspection programs, and meeting manpower funding requirements.

Elements 3007, 3008, and 3009 are reserved for future use.

Element 3011, Schedule and Cost. Consists of the compilation of data required to estimate repair and manpower costs and to plan industrial workloading related to the CIWS depot repair and overhaul processes.

Element 3012, Procurement. Consists of the planning and implementation of a procurement program for technical support services, spare and repair parts, subcontractors, and whatever else may be required to support the depot repairables and overhaul programs.

Element 3013, Quality Assurance. Includes the establishment and implementation of procedures and data collection pertinent to all phases of the depot repair process in order to assure that adequate quality is achieved throughout the entire depot repair cycle. Also includes the implementation of various tests to be conducted on restored or fabricated modules to demonstrate that quality control, adequate to meet technical repair standards, has been maintained in the industrial process.

Element 3014, Facilities, Support, and Test Equipment. Consists of planning for and management of real property and improvements thereto, including utilities, dedicated spaces, tooling, and security required for operation and support of the CIWS Depot Repair Program. Also included is the acquisition and maintenance of the support and test

(continued)

Table 3-1. (continued)

Element 3014 (continued)

equipment, both general and special, required for equipment and system tests in support of the depot repair and fabrication process. This support and test equipment includes computers, data printout equipments, and fixtures associated with the automatic test equipment stations.

Element 3015, Transition Planning. Consists of developing the plan and schedule for phase-down of the Interim Depot-Level Maintenance Facility (contractor) as the organic DOA capability is established. This task includes: projecting in-house facility capability and capacity with sufficient lead time to phase out NOSL contracts for IDLMF support; planning assimilation of Navy-owned IDLMF test and repair equipments into the DOA facilities; and, preparing information packages required to notify users and stock-points of transition schedules.

Element 3016, Technical Documentation and Data. Includes the development and maintenance of all documentation encompassing engineering procedures and drawings, instructions, tabular data, test results, and specifications for the depot repair functions. Also includes the compilation and reproduction of data required for configuration management, and the data required to manage the industrial support requirements for the CIWS depot repair process and for Integrated Logistic Support (ILS) of the restoration program, including inventory management of parts and spares.

Element 3017, Manpower. Consists of the administration and management of industrial manpower resources (capability and capacity), of engineering services (Government and commercial), and of training required to support the CIWS depot repair program.

Element 3018, Transportation and Handling. Consists of the development and management of the procedures, equipment, facilities, and manpower resources used for the movement, packaging, transfer, and handling of

(continued)

Table 3-1. (continued)

Element 3018 (continued)
materials and equipment associated with the CIWS repair and overhaul processes.

Element 3019, Industrial Engineering Support. Includes the development and implementation of processes and procedures required within the CIWS DOA, the adaptation of system specifications and standards for use in DOA repair and manufacturing processes, and the development and tracking of cost and schedule information regarding the DOA industrial process. Also includes the continuing engineering effort to modify the industrial and testing capability to accommodate changes in hardware and support equipment configuration.

Element 3021, Collection. Consists of collecting and processing CIWS equipment failure data from all sources, preparing data for analysis by determining data validity, purging the data base of nonpertinent data, and maintaining a system that provides rapid retrieval of data for analysis.

Element 3022, Analyzing. Includes monitoring and reviewing failure data to determine problem areas, failure trends, and system effectiveness achieved compared with that predicted, and monitoring the effectiveness of corrective action. Also includes, during data analysis, the recommending of new or additional data collection requirements (3021) to improve the engineering analysis process.

Element 3023, Dissemination. Consists of preparing failure analysis data for all required reports, assuring that reports fulfill recipient requirements, and providing feedback to data collection (3021) to identify additional user requirements.

Element 3024, Engineering Support. Includes the performance of reliability and maintainability engineering evaluations of hardware failures,

(continued)

Table 3-1. (continued)

Element 3024 (continued)

and the recommendation of corrective actions that can be taken to reduce failures -- e.g., improving or replacing components, redesigning circuits, and making changes in repair or manufacturing processes or specifications.

CHAPTER FOUR

PROGRAM ASSESSMENT AND PLANNING

4.1 REPORTING REQUIREMENTS

Timely assessment of program status and effective planning to achieve program objectives require that program management obtain significant feedback from all major program elements. Within the CIWS maintenance support community, feedback to management is to be accomplished through a comprehensive information reporting system that includes elements of standard Navy reporting systems such as MDS, SECAS, and CASREP systems, and elements specially developed to satisfy specific CIWS reporting needs. CIWS reporting is being approached as a system to ensure maximum utilization of existing reporting mechanisms and minimum development of new capability. Currently the CIWS reporting system is in the definition phase. Maintenance management reporting requirements are being identified and matched against existing reporting capabilities, and requirements for new capabilities are being defined. These are being assembled in a CIWS Maintenance Management Reporting System (MMRS) description, which will also contain reporting system responsibilities and operating information. Key information will be extracted from this description and summarized in this plan as appropriate.

4.2 DESCRIPTION OF MAINTENANCE MANAGEMENT REPORTING SYSTEM

The CIWS Maintenance Management Reporting System is intended to provide the maintenance program WBS Level 1000 management with the information needed to obtain the resources required for meeting fleet demands for CIWS modules and equipments, and to monitor the use of those resources. Its major purpose is to support DOA operation and planning in normal depot repair, system overhaul, ORDALT management, and maintenance-effectiveness

assessment and control. In addition, it is to provide a mechanism by which limited analyses of system problems can be easily and quickly performed. To the extent possible, data are extracted from existing collection and record-keeping processes to minimize the impact of fleet and DOA procedures. Table 4-1 is the outline of the description of the CIWS Maintenance Management Reporting System now under consideration.

Upon completion of the reporting system description, a system-level specification will be developed to guide system implementation and integration with other reporting systems and procedures being used by NAVSEA-62YG. This specification will give detailed requirements and procedures for data collection, storage, processing, and reporting, including definition of software, data bases, forms, data products, documentation, system utilization, and maintenance.

4.3 ASSESSMENT AND PLANNING

Specific requirements for program assessment and planning have not yet been developed. As these are defined they will be included in this section of the plan, together with associated procedural information.

Table 4-1. OUTLINE OF CIWS MAINTENANCE MANAGEMENT REPORTING SYSTEM (MMRS) DESCRIPTION

CHAPTER ONE: INTRODUCTION

- 1.1 Background
  - 1.1.1 CIWS Program
  - 1.1.2 In-Service Support Information Requirements
  - 1.1.3 MMRS Development Approach
- 1.2 CIWS MMRS Objectives and Scope
  - 1.2.1 Objectives
  - 1.2.2 Scope
- 1.3 MMRS Participating Agencies and General Responsibilities

CHAPTER TWO: MMRS DATA PRODUCT REQUIREMENTS

- 2.1 Required Products
  - 2.1.1 Cost/Budgetary Summary Products
  - 2.1.2 Inventory/Configuration Product
  - 2.1.3 ORDALT/Overhaul Products
  - 2.1.4 Maintenance Data Products
  - 2.1.5 Equipment Condition/Inspection Products
  - 2.1.6 Resource Utilization and Logistic Products
  - 2.1.7 Failure Analysis and RMA Products
- 2.2 Product Status Summary

CHAPTER THREE: MMRS DATA COLLECTION AND STORAGE

- 3.1 Data Requirements and Data Sources
- 3.2 Data Flow and Management
- 3.3 MMRS Data Bases

CHAPTER FOUR: MMRS OPERATION AND RESPONSIBILITIES

- 4.1 Data Collection
- 4.2 Data Base Maintenance
- 4.3 Data Product Generation and Distribution
- 4.4 MMRS Software Development, Maintenance, and Documentation

CHAPTER FIVE

PROGRAM COORDINATION

5.1 SPECIAL REPORTING REQUIREMENTS

Special reporting requirements will be developed to satisfy the needs of NAVSEASYSCOM management systems and NAVSEASYSCOM reports to higher echelons, e.g., Naval Material Command and OPNAV. In general, the required data will be those that provide planning, programming, and budgeting information for outyear resource requirements.

The specific reports now required are defined in SEATASKS, issued by the Program Manager, NAVSEA-62YG to Naval Ordnance Stations, Indian Head and Louisville. Additional reports will be defined as appropriate. Reporting requirements addressed in this section will usually be in the areas of resource utilization, inventory management, budgeting, failure analysis, and configuration management.

5.2 ADMINISTRATIVE COORDINATION

Matters pertaining to management and implementation of the CIWS Maintenance Management Program activities will be administered as outlined in the Work Breakdown Structure. In view of the many activities performed in a program of this size, it is expected that there will be minor differences between this plan and individual command operating procedures. Some compromises must evolve to effect congruity in the CIWS depot maintenance program; therefore, acceptance of work orders, project orders, and SEATASKS associated with the CIWS DOA constitutes acceptance of this management plan unless specific variances can be negotiated with NAVSEA-62YG.

CHAPTER SIX

RESOURCE MANAGEMENT

6.1 RESOURCE ACQUISITION

6.1.1 Funds Acquisition

Budgeting for initial funding requirements for the CIWS Designated Overhaul Activity has been based on the design agent's predicted repair-of-failure analysis and the planned schedule of procurement and installation. During the first two years of fleet operation, these estimated failure data will be reviewed and improved to incorporate operational experience. In addition, NAVSEASYSCOM (NAVSEA-62YD and NAVSEA-62YG) has been formulating depot-facility acquisition cost data for the past year and has incorporated these start-up costs into budget submissions. Future depot repairable program budget submissions will be compiled in the same manner as for other ordnance system repairables and major overhaul programs, with resources to be obtained from programs such as DDEOC and foreign military sales identified as required.

Funding requirements of annual and five-year forecasts will be required, as a minimum, from all WBS 2000 level activities. These requirements will be submitted to NAVSEA-62YG in a prescribed format (to be determined) and in sufficient time to permit NAVSEA-62YG to incorporate them into the annual budget requests. The designated activities responsible for WBS 2000 - Maintenance Management Support, 2010 - Designated Overhaul Activity Support, and 2020 - Failure Analysis Support will ensure their funding inputs incorporate the requirements needed to support the 3000 level elements.

6.1.2 Personnel Acquisition

The acquisition of program personnel is the responsibility of each agency involved in the program. The appropriate types and numbers of skilled personnel are to be acquired to carry out assigned functional responsibilities. Changes in agency ceiling points are not planned.

6.2 RESOURCE ADMINISTRATION

6.2.1 Funding Administration

Program funding will be administered primarily through the NAVSEASYSCOM funding document process to accomplish SEATASK Technical Instructions. In some cases, funding will be provided to other activities or private industry by the Level 2 activities, within constraints specified in Level 2 SEATASKS. Initially, funding allocations will follow the Work Request (level of effort) format to allow for inexperience and lack of adequate data from which to make accurate predictions of funding requirements. As the repairables program develops and workloads stabilize, activity funding will be allocated by means of project orders.

Funds for acquisition of the depot facility will be administered by the CIWS Maintenance Program Manager (1000). Funds for operating the facility will be administered by the Designated Overhaul Activity Support Director (2010).

6.2.2 Personnel Administration

Each program agency is responsible for its own personnel administration activities.

Additional details on funding and personnel management, and information concerning the management of other program resources will be included in this chapter as they are defined.

APPENDIX

PROGRAM DEVELOPMENT SCHEDULE

Figure A-1 shows the milestones in the development of the CIWS DLMF program.

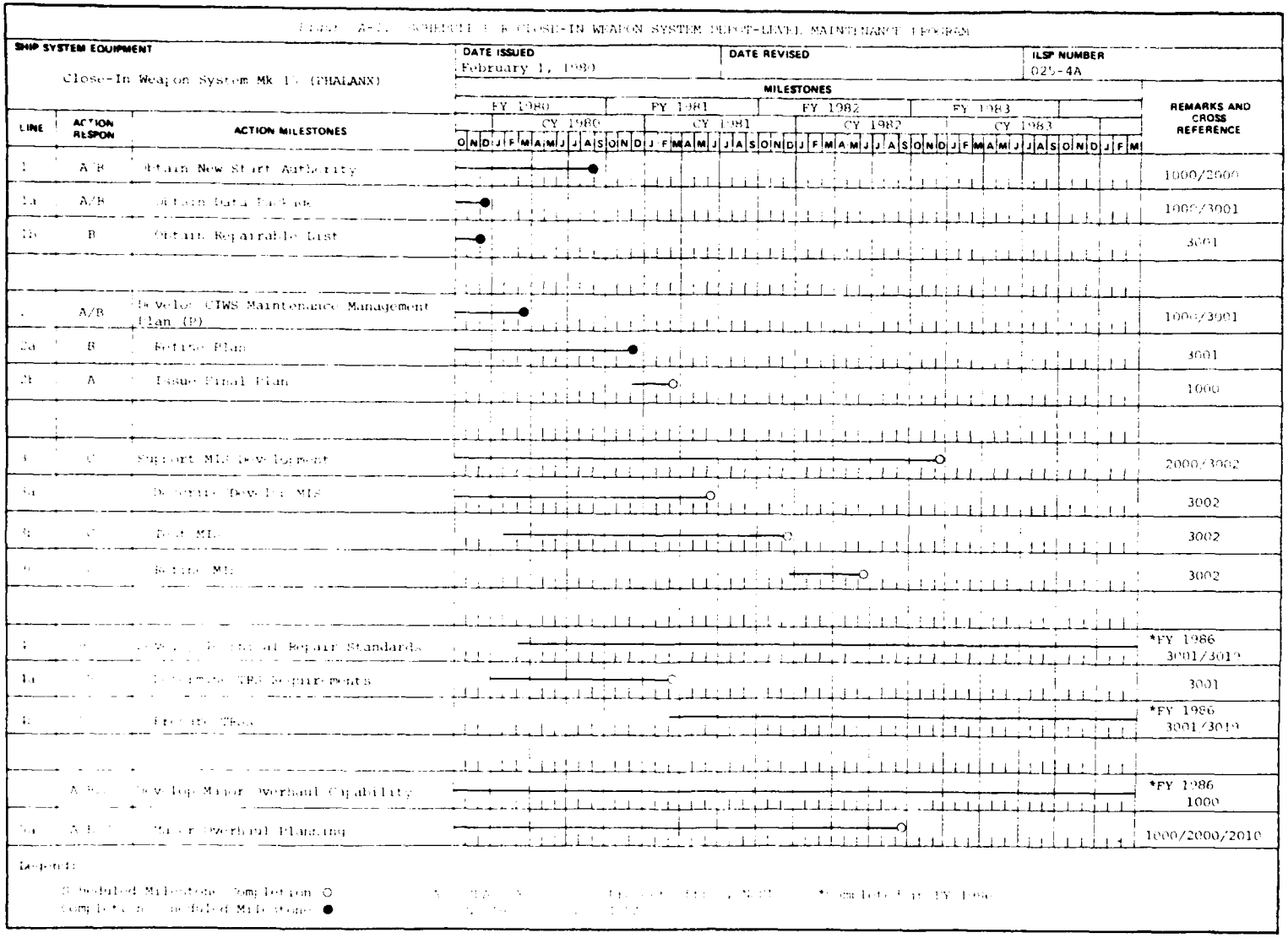

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FIGURE A-1 (SHEET 1)

SHIP SYSTEM EQUIPMENT	DATE ISSUED	DATE REVISED	ILSP NUMBER
Close-In Weapon System Mk 1 (PHALANX)	February 1, 1980		025-4A

LINE	ACTION RESPON	ACTION MILESTONES	MILESTONES	REMARKS AND CROSS REFERENCE
			FY 1980 / FY 1981 / FY 1982 / FY 1983	
			CY 1980 / CY 1981 / CY 1982 / CY 1983	
			O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M	
3	C	Complete Major Overhaul Capability	○	*FY 1986 2010
5	A/C	Develop DOA Plan	○	3014
5a	C	Develop Preliminary Plan	●	3014
5c	C	Refine Plan	○	3014
6c	C	Identify Manpower Requirements	○	3017
6d	C	Install Tooling Test Equipment	○	3015
6e	D	Develop CATIA	○	3013
6f	A/B/C	Validate Line Capability	○	3001/3014
6g	C	Indust Requirements	○	3004
6	A/B/C	Make Transition from Private Industry	○	2010
7	A/B	Plan Failure Data Analysis Center	○	3001
7a	A/B	Commence Planning	○	2020
7b	A/B	Establish Center	○	2020
8	A/B	Develop Depot Maintenance Interservice Milestones	○	1000/2000

Legend:

Scheduled Milestone Completion ○
Completion Scheduled Milestone ●

A - NAVAIR
C - Project Office, NOSL
D - LSEA

*Completed in FY 1986

APPENDIX B

PRELIMINARY MANAGEMENT PLAN FOR CLOSE-IN WEAPONS SYSTEM MK 15 FAILURE DATA ANALYSIS CENTER

This appendix presents the preliminary management plan intended to guide the CIWS personnel concerned with the establishment and initial planning for the operation of a CIWS Failure Data Analysis Center.

PRELIMINARY MANAGEMENT PLAN
FOR
CLOSE-IN WEAPON SYSTEM MK 15
FAILURE DATA ANALYSIS CENTER

December 1980

Prepared for

Manager, Surface Weapons Systems Maintenance Branch
Naval Ordnance Station
Indian Head, Maryland

under Contract N00174-80-C-0241

by

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FOREWORD

This report presents the results of work performed by ARINC Research Corporation for the Naval Ordnance Station, Indian Head, Maryland (NOSIH) (Code 5033), under Task 3 of Contract N00174-80-C-0241.

The Close-In Weapon System (CIWS) Mk 15 (PHALANX) is currently operational in active fleet units with ever-increasing numbers of systems being installed and accepted for operational use by the fleet. The CIWS Program Office must now respond to both acquisition and operations problems concerning CIWS operability and maintainability. The purpose of Task 3 was to describe the management planning required to establish a Failure Data Analysis Center (FDAC) in support of the CIWS Mk 15 Program. This report presents the preliminary plan that has been developed.

The management structure defined for the CIWS FDAC addresses all the necessary program-level and support-level activities and their respective responsibilities without designating an activity as the FDAC. The decision on the location of the FDAC has not been made by the program office. Therefore, this preliminary plan recommends the structure the FDAC should assume once an activity has been designated. This preliminary management plan is intended to be a working document that will change to reflect future program office decisions concerning CIWS maintenance management -- the foremost being the tasking of an activity to operate the FDAC. Distribution and revision of this plan is controlled by the NOSIH.

ABSTRACT

This preliminary management plan provides advance information to guide personnel concerned with the establishment and initial planning for the operation of a Close-In Weapon System (CIWS) Failure Data Analysis Center. It documents initial objectives, policies, relationships, constraints, assignments, and organizational structure and describes procedures planned for the collection, analysis, and reporting of CIWS failure data. The CIWS Failure Data Analysis Center will provide program management with failure data analysis to monitor system, equipment, and component failure recurrence during the life of the system.

CONTENTS

CONTENTS (continued)

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

The Close-In Weapon System (CIWS) Failure Data Analysis Center (FDAC) is being established to monitor and improve the reliability of the weapon system from production through its remaining life.

Failure analysis of fleet gun weapon systems has historically been performed through the use of special purpose reporting systems (messages, letters, and narrative reports), maintenance and material management (3-M) data, and routine site visits by hardware manufacturers and Navy civilian and military engineering representatives. This methodology sometimes results in an enormous quantity of data that are often contradictory and confusing. Conversely, there are times when inadequate data are available to analyze an apparent reliability problem of an equipment or system. In nearly every case, additional data must be collected before an effective equipment analysis can be conducted. Because management and ordnance engineering activities, as well as hardware manufacturers, are eager to correct reliability and maintainability problems in the fleet, rash and redundant corrective action has often been taken that did not efficiently improve the product. In addition, when a design alteration is applied only as the result of fleet reports, it has been difficult to anticipate or correct the most significant reliability problems, because the reports frequently have not been systematically collected and analyzed before corrective action was undertaken.

In the case of the CIWS, with over 400 planned installations, organizational maintenance does not address actual piece-part failures; in most

cases the fleet will not be able to provide the detailed data necessary to initiate analysis of reliability problem areas. The CIWS maintenance strategy specifies that repair of the CIWS at the system, component, module, and piece-part levels be conducted at the Navy's designated overhaul activity (DOA). The Naval Sea Systems Command (NAVSEA) is currently planning and funding the initiation of a CIWS DOA at the Naval Ordnance Station (NOS), Louisville, Kentucky (NOSL). Thus, the actual repair data will only be available at the DOA, and failure data information will be collected through reporting systems in effect at the DOA.

During the early planning stages for the CIWS it was determined that failure data analysis would be performed separately from depot maintenance (repair) and in-service engineering activities, so that these two important groups could pursue depot establishment and system installation and check out support functions. After the DOA becomes operational, it is still in the program's best interest to keep the FDAC separate from the aforementioned activities, since their primary responsibilities will be the day-to-day operation of the DOA and planning orderly alterations to enhance the operational effectiveness and maintainability of the CIWS.

1.2 OBJECTIVE

The objective of this preliminary management plan is to furnish structured guidance to meet operational, funding, and support requirements for the establishment of a CIWS FDAC. This plan serves as a guide to develop and integrate the FDAC within the existing structure of the CIWS maintenance program.

1.3 SCOPE

This plan documents the management structure and responsibility assignments defined by NAVSEA to support the development and implementation of a Failure Data Analysis Center for the CIWS Program. The detailed management structure and responsibilities within the FDAC are purposely

excluded from this plan and are to be developed by the organization designated by NAVSEA as the FDAC. However, this plan does address the overall structure of the FDAC and the optimum analysis procedures that such an analysis center should utilize.

1.4 OVERVIEW

The CIWS Failure Data Analysis Center will serve as an autonomous advisory activity to the CIWS maintenance manager (NAVSEA-62YGE), providing failure data analysis during CIWS system life. The center will be a computer-oriented facility staffed by computer specialists for system maintenance and engineering specialists and analysts for failure data analysis. The computers will be used to store, display, and produce failure data on a real-time basis for the generation and analysis of information. The information generated will provide NAVSEA and the in-service engineering agent (ISEA) with the initial indications of CIWS failure recurrences and trends. The reports are intended to be a specific subset of the CIWS maintenance management reporting system (MMRS).

1.5 ORGANIZATION

The following chapters present the preliminary plan for the establishment and operation of the CIWS FDAC. In accordance with the maintenance management plan for CIWS Mk 15, the work elements of the FDAC are 2020 and 3020 through 3024 (3025 through 3029 are not used). Chapter Two of this management plan defines the project levels and responsibilities of the FDAC, Chapter Three describes the operation of the FDAC, and Chapter Four presents the program resources that will be required to support and maintain the FDAC. The Appendix lists abbreviations and acronyms commonly used in this report.

CHAPTER TWO

FDAC PROGRAM RESPONSIBILITIES

2.1 INTRODUCTION

As part of the CIWS Program, the Failure Data Analysis Center will be responsible for identifying and analyzing system failures and recommending appropriate corrective action. The FDAC project effort is important to both users and management -- users will benefit from the direct support and information concerning the maintenance and operation of their systems, and program management will benefit from the orderly and scientific approach to system reliability and maintainability resulting from FDAC recommendations. The FDAC will discourage the proliferation of engineering change proposals (ECPs) and ordnance alterations (OrdAlts) originating from various Government or private activities with an assigned interest in the CIWS Program.

2.2 PROJECT MANAGEMENT LEVELS

The three levels of FDAC project management are (1) headquarters, (2) support activities, and (3) FDAC organization. In essence, the established CIWS maintenance management organization will also represent the structured organization for the FDAC project. Figure 2-1 shows the CIWS maintenance management organization and the position of the FDAC within that organization.

2.3 POLICY AND HEADQUARTERS SUPPORT

The Commander, NAVSEA is responsible for management of the CIWS. Within NAVSEA, the CIWS Program Office (NAVSEA-62YD) is responsible for

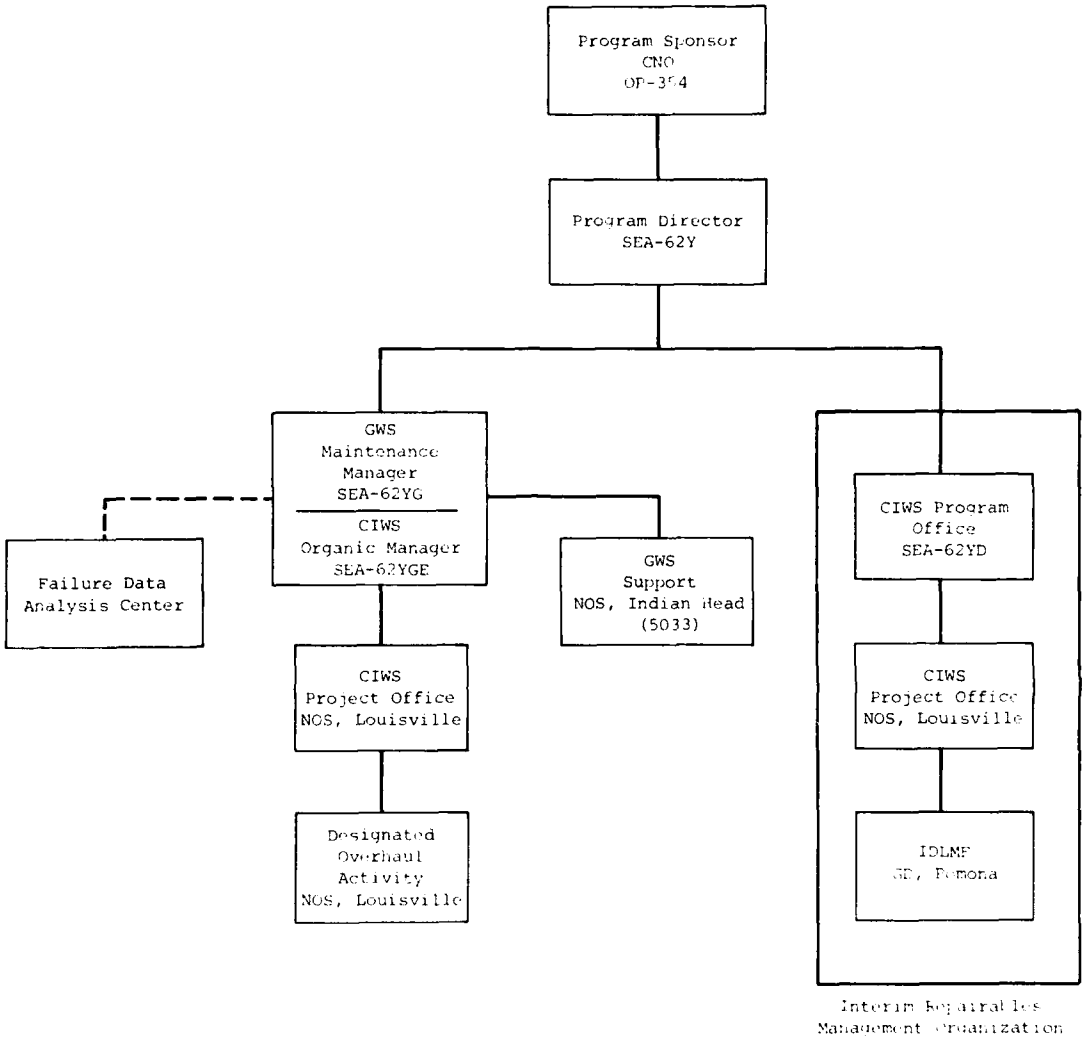

Figure 2-1. CIWS MAINTENANCE MANAGEMENT ORGANIZATION

life-cycle management of the CIWS. The Gun Systems Support Office (NAVSEA-62YG) is responsible for the replacement of ordnance on active fleet and Naval Reserve training ships with overhauled or properly configured systems or components. Because of these charters, both organizations are the designated management agents for sponsoring CIWS repair support to the operating forces; they report to the Director, Surface Gun Weapon Systems Subgroup (NAVSEA-62Y). The planning, establishment, and operation of the Navy's DOA is the responsibility of NAVSEA-62YG; the FDAC will be an integral part of this DOA operational support. Although life-cycle engineering management support of the CIWS is a function of the project manager, the data needed to originate any necessary changes or improvements to the CIWS are collected and provided by NAVSEA-62YG. The decision to place the management support of the FDAC under the Gun Systems Support Office was jointly agreed upon by NAVSEA-62YD and NAVSEA-62YG.

The specific responsibilities of policy and headquarters support-level commands (NAVSEA-62YD and NAVSEA-62YG) include submitting budget requirements to the Chief of Naval Operations (CNO) via the Chief of Naval Material (CHNAVMAT), funding the FDAC, and providing direct policy support to FDAC management.

2.4 SUPPORT ACTIVITIES

FDAC performance will reflect the data and management support provided by various support activities. NAVSEA-62YG intends to maintain a comprehensive data exchange with several activities. These activities will collect system data and participate in the FDAC's support of the CIWS. The data collected during the overhaul and restoration process will include the majority of the FDAC's data input. The primary support activity will be the DOA at NOSL. NOSL will be responsible for providing the FDAC with required repair data in the format specified by the FDAC. The Surface Weapons Systems Maintenance Branch of NOSIH will have a similar relationship with the FDAC. The information originating from NOSIH will deal with the results of the Material Condition Review (MCR) Program coordinated at NOSIH. The results of these MCR inspections will be forwarded to the FDAC in the format specified by the FDAC.

The fleet will also provide data support to the FDAC. Data input from the fleet can be obtained from a central collection agency such as the Fleet Analysis Center (FLTAC) and from the individual units having CIWS. Data from these activities will be obtained through the use of such existing reporting formats as Maintenance Action Form, Office of the Chief of Naval Operations (OPNAV 4790) (2K), and Commanding Officer's Narrative Reports (CONARs). The remainder of the functional support provided in this area will come from various activities, such as the Maintenance Support Office Department (MSOD), Mechanicsburg, Pennsylvania; Ships Parts Control Center (SPCC); Naval Sea Support Centers (NAVSEACENs); and the Weapons Quality Evaluation Center (WQEC), Concord, California. These support agencies will provide both data and engineering analyses as requested.

2.5 FDAC ORGANIZATION

Planning for the establishment and management of the FDAC will follow precedent insofar as field activity and capacity permit. The FDAC will collect, analyze, and disseminate statistical and technical information concerning the CIWS's maintainability and operability. The FDAC director will be responsible for establishing and maintaining the organizational structure to support a computer-oriented analysis center. This will require (1) submitting annual and five-year forecasts of funding requirements, (2) determining man-year level-of-effort requirements, (3) determining training requirements, and (4) maintaining liaison and coordination with supporting activities. The FDAC director will serve the CIWS maintenance manager (NAVSEA-62YGE) in a staff advisory role.

CHAPTER THREE

FDAC OPERATION

3.1 INTRODUCTION

The basic concept of the FDAC is to provide a data base management system with the capability to promptly enter, store, process, and recall CIWS effectiveness, reliability, and maintainability data.

The FDAC will assess performance, detect trends, isolate failure causes, and evaluate corrective action for all modifications of the CIWS throughout its life cycle. Input data will be collected in various forms from several data sources. The FDAC will generate summaries, by category, for failure cause correlation analysis. FDAC output will also be used to determine failure trends and the validity of repair parts and rotatable pool depth estimates.

3.2 REQUIREMENTS

To meet planned objectives, the FDAC must accomplish the following:

- Collect, process, and store reliability and maintainability data in a computerized data bank and continuously improve the quality of these data by refining the processing techniques and purging the system of nonpertinent data.
- Maintain and improve the system's software capability to provide rapid retrieval and analysis of the data.
- Perform technical data analysis to determine problem areas, failure trends, and effectiveness of corrective actions, and recommend solutions to reliability and maintainability problems.

- Alert maintenance management to potential problems and provide amplifying information on current problems to assist in the decision-making required to eliminate CIWS failures as early as possible in the CIWS life cycle.
- Provide data users with CIWS reliability and maintainability information to support the CIWS as well as other Navy programs.

3.3 FDAC STRUCTURE AND OPERATION

The proposed FDAC is structured to permit maximum use of and easy access to information for engineering analysis. Figure 3-1 shows how all data and information will be handled in the FDAC.

The CIWS FDAC will derive its efficiencies from an easily accessible data base management system and by singular tasking to support only CIWS analyses. The planned number of fleet CIWS installations establishes the potential to generate enormous quantities of maintenance, failure, and overhaul and repair data. It is essential that a computer-oriented analysis center be used to keep the CIWS program managers and maintenance managers apprised of the system's effectiveness and maintainability. To accommodate large amounts of data, the FDAC's data base will be formatted for simplified and expeditious entry, retrieval, and analysis of data. Preformatting data on various screens with a "smart" cathode ray tube (CRT) terminal will reduce the time and clerical personnel required to update the data base. This concept is basic to the ability of the FDAC to be responsive to the needs of the ashore and afloat commands.

The initial requirement for the FDAC is access to a computer facility that can be dedicated solely to CIWS support. The FDAC must have a real-time, dynamic, cost-effective system that can respond to the potential problems associated with data handling delays, security restrictions, and software difficulties.

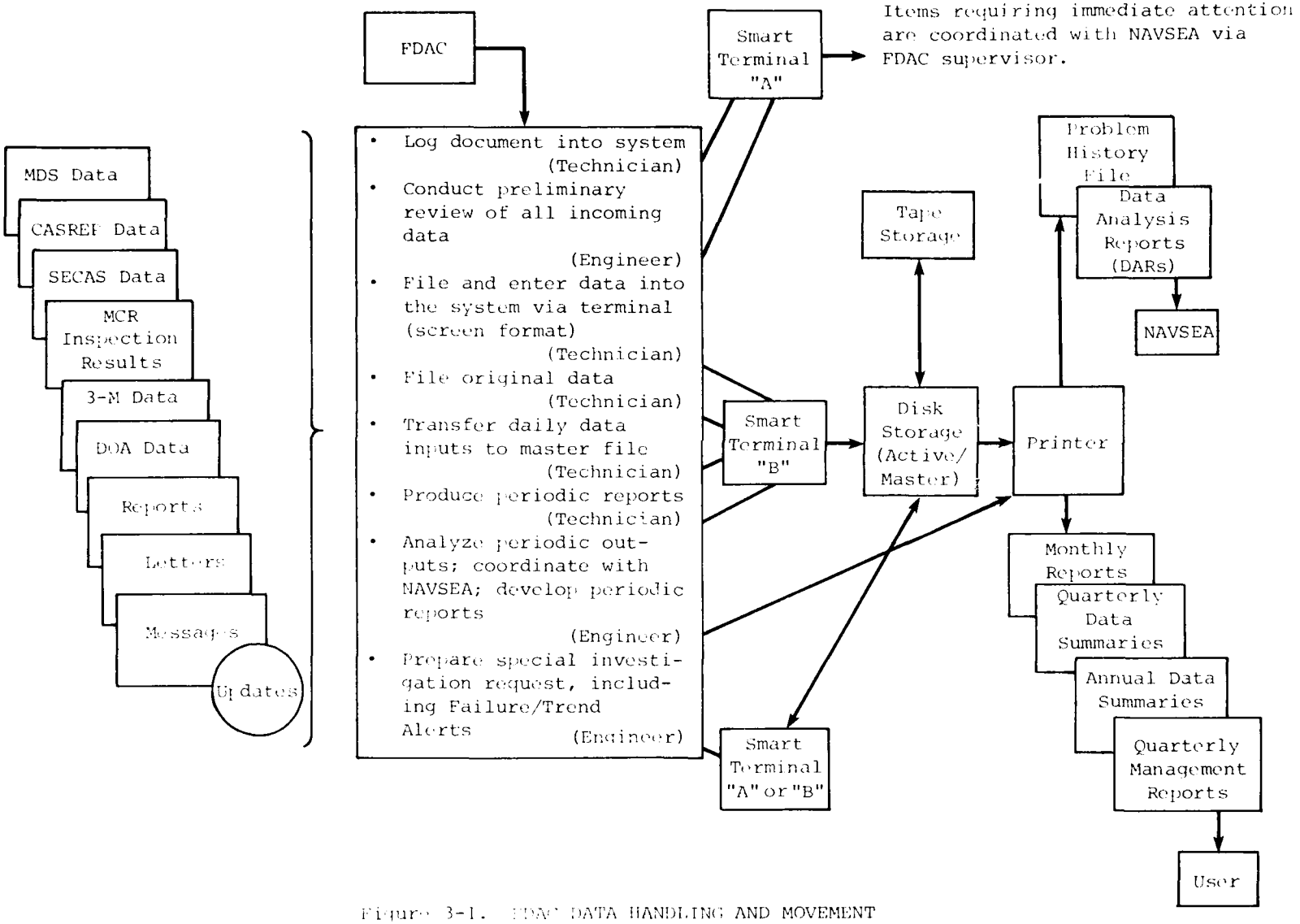

Figure 3-1. FDAC DATA HANDLING AND MOVEMENT

At a minimum, the proposed computer system should offer the following key features:

- Capability to store a minimum of two years of data on-line
- Two CRT terminals with preformatted screens for direct data input and output
- On-line response to input queries
- Printer for output of hard-copy data
- Magnetic tape drive for back-up and utility programs
- Documented, cost-effective data base management software
- Provisions for system expansion

The proposed computer system will be controlled entirely by the FDAC, allowing the desired on-line response to input queries and eliminating any security problems associated with transmitting classified data. It is envisioned that the entire computer system will be housed within the confines of the FDAC; however, that is not a necessity, as long as data access and transmission do not suffer from separation. It is more important for the computer system to be totally dedicated to the CIWS than to be physically situated in a single location. The following subsections describe the functions of the FDAC illustrated in Figure 3-1 in more detail.

3.3.1 Data Collection

Data collection consists of obtaining and processing failure data from specified sources, preparing the data for analysis by determining its validity, purging the data base of nonpertinent data, and maintaining a system that provides rapid retrieval for analysis. The FDAC will require reliability/maintainability-related data that will provide CIWS managers with information highlighting problem areas, failure trends, and the effectiveness of corrective actions.

Because of the nature of the maintenance strategy selected for the CIWS (replaceable module maintenance), the primary source of failure data will be the DOA, which will repair CIWS modules turned in by ship's force.

The organizational level will provide some system-level failure data via the existing 3-M system, maintenance data system (MDS) subsystem, casualty reports (CASREPs), and various other operating and performance reporting systems. Many of these data systems are maintained by support activities, such as MSOD and WQEC. Other input data systems maintained by WQEC, Concord, such as the Gun Weapon System Replacement Program (GWSRP) and the Ships Equipment Configuration Accounting System (SECAS), are also expected to provide data to the FDAC. A summary of data in the WQEC data base is provided in Table 3-1, together with the associated data sources.

In addition to the data listed in Table 3-1, the FDAC will require more detailed failure data, which can only be provided by the DOA. These data will actually identify specific part failures from the CIWS modules. The data base for the DOA is currently being defined; it will contain such necessary analysis information as: CIWS module and assembly repair data, data to fully describe all repair parts needed for module and assembly repair and their inventory status, system failure history data, and depot-level test and quality assurance data. As the DOA data base and individual data files are identified, FDAC data requirements will have to be interfaced with them.

3.3.2 Data Base Interface

To obtain required data, the FDAC will have to interface with a number of different management information systems (MISs). The following subsections summarize the MISs and note the points of contact for obtaining data.

3.3.2.1 Ships Maintenance and Material Management (3-M) System

The ships maintenance and material management system provides fleet-wide data collection and processing services to support Navy maintenance management programs. The ships 3-M system is operated by the MSOD, Mechanicsburg. System data are obtained from OPNAV Form 4790/2K, Naval Supply Systems Command (NAVSUP) Form 1250, and DD Form 1348 documents by activities reporting under the authority of OPNAVINST 4790.4. These data are stored in the MSOD central data bank. Various reports are regularly produced from the data stored in the data bank, and many other reports can

Table 3-1. CIWS-RELATED DATA FILES MAINTAINED AS PART OF THE SHIPS MDS DATA BASE AT WQEC, CONCORD

File Name	Data Source	Description
Ammunition Expenditure	SPCC	Monthly data on expenditures of all ammunition types
CASREP History*	MSOD	Detailed casualty report data for all weapon and related systems and equipments
DCAP Operating Time Survey	NOSL	Equipment time meter and cycle counter readings
EIC Nomenclature	WQEC	Nomenclature and other reference information by equipment identification codes
Equipment/System/APL Master Index	NOSL	Allowance Parts Lists for all weapon and related systems and equipments
Master Ordnance Configuration	NOSL	Detailed configuration data for all weapon and related systems and equipments
MDS Narrative	MSOD	Narrative data extracted from the shipboard MDS history file
NAVORD Form 8810/2 Time Meter Readings	FLTAC	Detailed time meter readings provided via NAVORD Form 8810/2
Population File	WQEC	System and equipment populations by installation for all fleet units
Shipboard MDS History	MSOD	Detailed 3-M maintenance and supply system data extracted from the MSOD 3-M maintenance data base for weapon and related systems and equipments
Ship Data Master	WQEC	General status information on weapon systems and equipments for all installed items
Ship Employment*	OPNAV	Detailed ship operation histories showing operational periods of all weapon systems and equipments
Commanding Officer's Narratives*	Fleet	Detailed operation, maintenance, training, and problem information from all commanding officers regarding weapon systems and equipments
Condition/Inspection Reports	NOSIH	Detailed data on weapons system and equipments conditions developed for the Gun Weapon System Replacement Program

*Classified files.

be produced to satisfy special reporting requirements. Navy Fleet Material Support Office (FMSO) publication FMSOINST 4790.2, an outline and guide for use in the selection of 3-M information reports, provides general and product description information for the system. This guide or other information concerning the 3-M system can be obtained by contacting MSOD Code 9311, telephone Autovon 277-2043/3124 or commercial (717) 766-8511, extension 2043 or 3124.

3.3.2.2 Ships Maintenance Data System (MDS)

The ships maintenance data system, operated by WQEC, Concord, provides detailed maintenance information to support a wide range of Navy maintenance and maintenance management programs. Input data for the MDS are obtained from many sources, either as required data from original documents or as data generated by some other system. Many data products are regularly produced and distributed by the MDS, and many others can be produced to satisfy special reporting requirements. The ships maintenance data system products catalog, product number A0001, provides general descriptive information about regularly produced MDS data products. This catalog or other information concerning the MDS can be obtained from WQEC, Code 384, telephone Autovon 253-5861 or commercial (415) 671-5861.

3.3.2.3 Gun Weapon System Replacement Program

The Gun Weapon System Replacement Program is sponsored by the Gun Systems Support Office (NAVSEA-62YG) to support the overhaul and upgrading of fleet gun weapons systems. In support of this program, an information reporting system was developed and implemented by NOSIH using the data collection and processing resources of WQEC, Concord. Information in this system includes material condition levels; inspection, overhaul, removal, and installation schedules; equipment installation and overhaul locations; and equipment identification and reference data. Several types of evaluation, status, and tracking data products are produced from the system's information data bases. Details concerning the system's information and data products can be obtained from NOSIH Code 5033, telephone Autovon 364-4719 or commercial (301) 743-4719. Information concerning data collection

and processing, data bases, and report contents and availability can be obtained from WQEC, Code 384 (telephone listed previously).

3.3.2.4 Ship Equipment Configuration Accounting System (SECAS)

The Ship Equipment Configuration Accounting System is sponsored by NAVSEA-0411 to support configuration management of ordnance, electronics, and hull, mechanical, and electrical (HM&E) equipments installed on Navy vessels. The ordnance equipment portion of SECAS is operated by WQEC, Concord. Input data concerning the configuration of ordnance equipments are generated by ISEAs and provided to WQEC in several ways. SECAS data products are summarized in the SECAS catalog of products. This catalog and general information concerning SECAS can be obtained from NAVSEA-041, telephone Autovon 222-8798 or commercial (202) 692-8789.

3.3.2.5 DOA Information System

(A summary of the DOA information system will be included when the system reaches a state of development such that a summary would be meaningful for comparison with existing data sources and systems.)

3.3.3 Data Receipt

Figure 3-2 traces the movement of a sample document through the FDAC. When documents arrive at the FDAC, a data clerk will log them into the master log through the terminal. The master log is the "bookkeeper" that keeps track of the physical location and status of all data before they are entered into the FDAC processing data bank. The clerk will duplicate the report, file the original, and send a copy to the FDAC supervisor, who will determine if it is suitable for entry into the data bank or if it is "information only." Duplicate data or "information only" data are rejected and not used for data bank updates. Rejected data are not followed up on unless a definite pattern of input error is detected. Data considered to be suitable for entry will be screened by an engineering specialist (ES). The ES will utilize the FDAC data base and possibly other

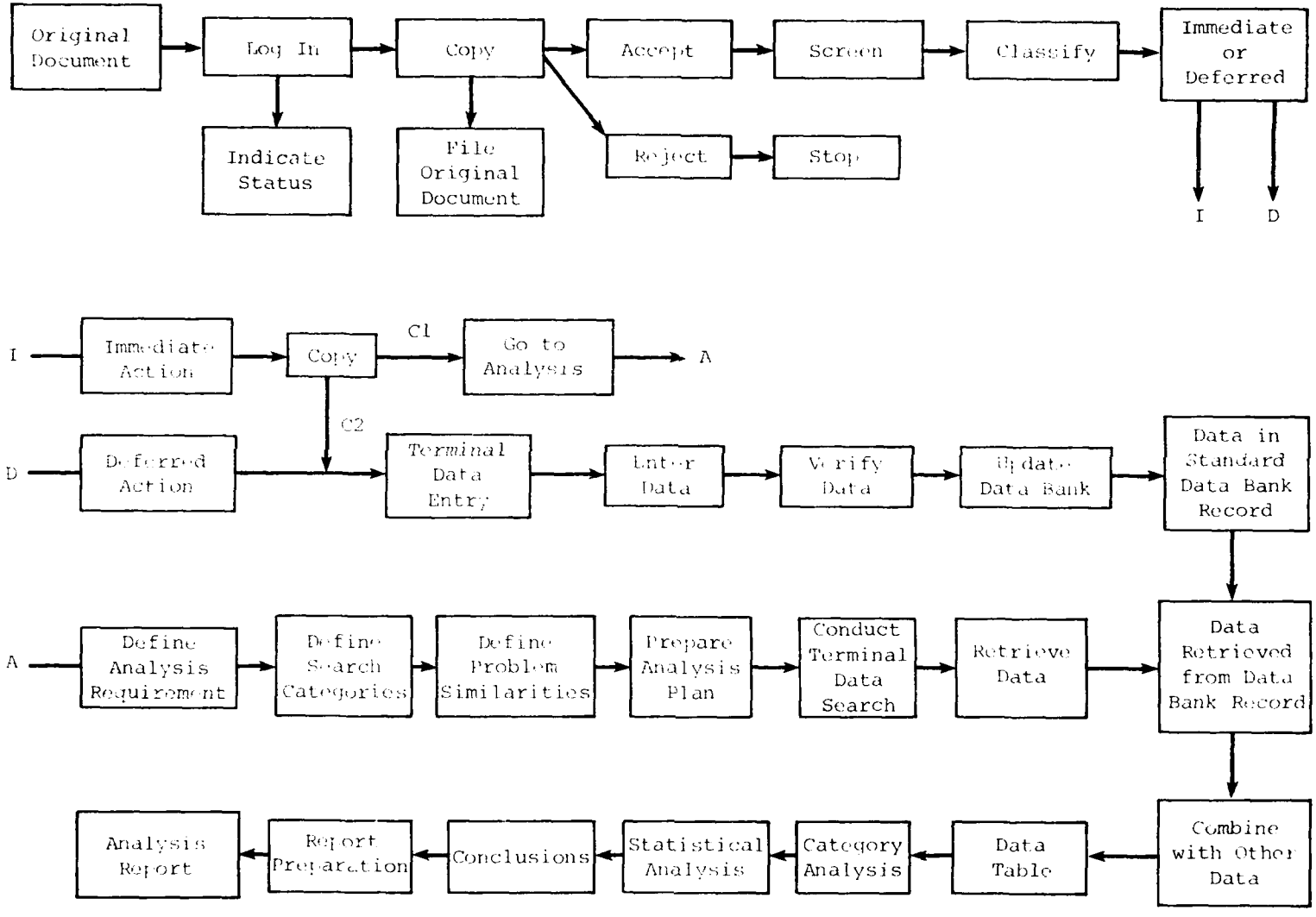

Figure 3-2. DOCUMENT FLOW THROUGH THE FDAC

historical information for review of data. At this time the ES will perform the following tasks, as appropriate:

- Enter data into the system via the terminal
- Recommend initiation of a failure alert activity
- Designate the level of attention to be given to the documented condition as either immediate (I) or deferred (D) (an "I" condition will be so entered in the bookkeeper log)
- Update the failure history file as required

The documented information will then be turned over to the data clerk for processing, as discussed in Section 3.3.4.

3.3.4 Data Processing

The FDAC will be responsible for processing large quantities of data when all CIWSs are operational. To allow accurate analysis of all available information and to ensure prompt identification of problems and corresponding corrective action, this function of the FDAC will have to be well organized and administered.

3.3.4.1 General Procedures

Data processing is shown in Figure 3-2, beginning with a deferred action and following through to an analysis report. The clerk tentatively decides whether the report represents new, updated, or previously reported information. This determination is based on existing information in the FDAC data base, which is searched by using a cross index of hardware National Stock Numbers (NSNs) or other identifier nomenclature.

If the information is a duplicate or an update to a previous event, the computer will so indicate, and the original event information can be retrieved from the FDAC data files (printout), attached to the current information, and forwarded to the specialist for verification. If the clerk determines that the information is a new event, the next sequential number is assigned. The new event information is forwarded to the specialist for verification of completeness and accuracy of data.

Upon completion of the specialist's verification, the clerk enters the information. If the contributing document is an update, the original data are recalled on the display, and the update information is added. If not verified as an update, the document is entered as a new event. All input data are verified to ensure accuracy. Once the data have been entered into the standard data bank record, they can be retrieved for analysis or report preparation.

3.3.4.2 Periodic Investigations

At a minimum, the FDAC data file will be searched monthly by specialists to detect repetitive failures and failure trends. In conducting the investigations, the FDAC specialist will first check the data base for a significant increase in failures that may have occurred during the month. Such increases will automatically be flagged by the computer so that they can be investigated in detail. If the specialist detects a failure trend, action will be initiated with the use of a Failure/Trend Alert form, shown in Figure 3-3. The alert will be reviewed by the cognizant FDAC engineer, who will investigate the failure and recommend corrective action. The Failure/Trend Alert will then be forwarded to NAVSEA and the ISEA for attention and action. After appropriate review and recommendations are made by NAVSEA or the ISEA, the alert will be returned to the FDAC with the findings indicated. Copies of the completed forms will be placed in the NAVSEA and FDAC files for future reference.

In addition to these periodic investigations, data sorts required as part of the quarterly data summaries, scheduled reports, and special reports will be used to detect and report failure trends. Table 3-2 presents some of the data products the FDAC will produce.

3.3.4.3 Special Investigations

Supplemental to the periodic FDAC searches, a wide variety of special automatic data processing (ADP) printouts and data summaries can be prepared. These summaries can be tailored to reproduce data concerning only those failures of particular interest.

FA NO._____

FAILURE/TREND ALERT

DATE_____

To NAVSEA CODE _____

Subject _____

The following failure(s)/trend(s) has (have) occurred and is (are) being brought to your attention for investigation

_____

_____

_____

_____

_____

_____

_____

FDAC CODE_____

Please indicate your findings below:

_____

_____

_____

_____

_____

_____

_____ _____

DATE SIGNED

Figure 3-3. SAMPLE FAILURE/TREND ALERT FORM

Table 3-2. PROJECTED FAILURE DATA ANALYSIS CENTER INFORMATION PRODUCTS		
Data Summaries	Scheduled Reports	Special Reports
Circuit Card Assemblies Repaired Total CIWS Repairs Performed System Level Failures Failures by Category Repair Part Utilization Repairs by NSN Number of Failure/Trend Alerts Failure Alerts by EIC Reliability by Factors: Piece Part/Component/ Subsystem/System	Monthly, Quarterly, Annual Trend Assessments Failure/Trend Alerts Data Analysis Reports Failures by Fleet	Failure Projections Reliability Comparisons Regression Analysis

Data Analysis Reports (DARs) will be used as the primary method of data delivery for searches not initiated by a Failure/Trend Alert. A sample DAR form is shown in Figure 3-4. DARs will be requested by outside activities desiring a special search when FDAC periodic summaries do not provide sufficient data to adequately identify or resolve a suspected problem. DARs will be used as the primary method of data delivery for special searches.

3.3.4.4 Problem History File

A problem history file will be originated and maintained. This file will contain information on problems with CIWS equipment requiring corrective action. Failure alerts and special survey tasks will provide a portion of the file data. The cognizant engineer should assess the type of problem that brought about requirements for corrective action (e.g.,

DATA ANALYSIS REPORT		NUMBER
		DATE
		ITEM
TO	REFERENCE	
PROBLEM SUMMARY		
REQUESTED BY	TELEPHONE NO./EXTENSION	DATE
DATA ANALYSIS SUMMARY		
PREPARED BY	APPROVED	DATE
		PAGE OF

Figure 3-4. SAMPLE DATA ANALYSIS REPORT FORM

design, production, maintenance, and logistics). The recommended corrective action will be included as part of the cognizant engineer's analysis. A sample of the proposed problem history file report form is shown in Figure 3-5.

3.3.5 Data Input

Data will be entered directly through the use of formatted CRT terminal screens rather than through a multistepped method involving failure forms that are completed by hand, keypunched, verified, validated, and fed to the computer. A "smart" CRT terminal will allow the operator to fill in the formatted screen, verify and validate data directly, and then enter the data into the system.

Initially, two CRT terminals will be needed to handle data entry requirements, data query, software development, and back-up system control. This requirement is based on current production and installation rates, coupled with an FDAC start-up of no later than the first quarter of FY 1983. If additional terminals are required, they could easily be added to the system when the total fleet CIWSs are operational.

3.3.6 Data Storage

When the FDAC is initiated, all existing operational failure data will be formatted and entered into the system. These data will be kept on-line on disc memory during normal working hours. Data can be queried on a real-time basis through the CRT terminals. On-line memory should consist of data that are no more than two years old. As the information becomes dated (over two years old), it will be transferred to another storage medium, such as magnetic tape. Sufficient storage will be provided to allow for the monthly processing of approximately 1,500 documents.

3.3.7 Data Output

The three major activities within the CIWS Program that are directly involved in system maintenance are (1) the Gun Systems Support Office (NAVSEA-62YG); (2) the designated overhaul activity, NOSL, and (3) the in-service engineering agency, NOSL. Effective system support by the three

ACTION NUMBER	DATE ASSIGNED	ITEM IDENTIFIER	PROBLEM CATEGORY AND DESCRIPTION	CORRECTIVE ACTION RECOMMENDED/TAKEN	DATE ACTION TAKEN

Figure 3-5. SAMPLE PROBLEM HISTORY FILE

activities largely depends on the amount and quality of maintenance information available. This information will be disseminated through the newly developed CIWS maintenance management reporting system. The primary objective for the CIWS MMRS is to ensure that program-level managers have the necessary data and information to support the life-cycle operation of CIWS maintenance programs, particularly those involving the CIWS DOA. The FDAC's responsibility in providing information will center on the generation of meaningful and accurate failure analysis reports.

Failure analysis and reliability, maintainability, and availability (RMA) data products identified for the FDAC computer system are those data products which provide information on the CIWS at the system, component, module, and piece-part levels for repairable item or nonrepairable item characteristics and circuit card assembly. Such information as failure and removal rates, mean time to repair (MTTR), mean time between corrective maintenance (MTBCM), and availability will be incorporated into the system. The FDAC will produce other data needed to determine characteristics not provided by MMRS products, to provide information concerning the engineering analysis of CIWS hardware failures, or to classify system failures into identifiable failure categories. This kind of information is required to support all engineering performance assessments and to validate performance improvements that result from all hardware, maintenance, and operational changes. This information is generally needed by all CIWS engineering and management codes. Examples of data and information reports that may satisfy the above requirements are identified in Table 3-3. As previously mentioned, the FDAC will be responsible for failure analysis and RMA-related data products.

3.4 FDAC DATA ANALYSIS

The FDAC will analyze the acquired raw data to (1) translate the processed data into meaningful management information, (2) determine failure trends and RMA status, and (3) identify potential problems. Typical subjects of FDAC analyses will include the following:

- Operational reliability achieved by CIWS
- Reliability of DOA repairables after introduction to the fleet

Table 3-3. FAILURE ANALYSIS AND RMA PRODUCT SUMMARY

Product Title	Description	Agency	ID Number
Ship Employment Listing	Displays day-to-day ship movement information from the ship employment file	WQEC	A0571
3-M Steaming Hours Data	Displays maintenance and steaming hours data by unit identification code (UIC) for EIC or APL	MSOD	4790.S5007
Reliability/Maintainability	Summarizes maintenance man-hours, maintenance times, and corrective maintenance action counts by EIC and unit serial number for each UIC reporting data for that EIC	MSOD	4790.S5660
Electronic Problem Equipment	Ranks the performance of all equipments within a specified EIC and field change group	MSOD	4790.S6243
Gun Mount Operate Time Summary	Summarizes estimated operate times in various use categories by ship class and gun mount population	WQEC	A0580
Equipment Operate Time Summary (by Ship and Month)	Displays monthly interpolated operate times by meter designation for each ship and serial-numbered equipment selected by EIC	WQEC	A0333/ A0334
Gun Mount and System RMA Summaries	Summarizes and graphs gun mount RMA performance over a two-year period by quarters, using MTBCM, MTTR, availability, mean downtime, and mean delay times as measures of performance	WQEC	A0720/ A0740
Module/Assembly RMA Summary	Summarizes the RMA performance of replacement parts used to maintain CIWS repairable items, using failure rate (by repairable item and overhauls as a measure of performance)	FDAC	TBD
Repair Parts Failure Summaries	Summarizes the identified causes and number of repair part failures for parts specified by component	DOA	TBD
System Failure Analyses Status Report	Displays failure analysis status for each identified system failure	DOA	TBD
Failure Analysis Summary Report	Summarizes the application area, current status, and known results of each failure analysis task assigned to the CIWS FDAC	FDAC	TBD

- Achievement of reliability goals for equipment modifications
- Significant defect trends for new and repaired items
- Specific reliability problems (directed to the attention of NAVSEA via the failure alert system)
- Specific maintainability problems
- Failure category summary
- Activity, past and planned

Detailed analyses will be conducted, and data will be evaluated and summarized to the extent necessary to provide visibility of potential problems or trends. In a defect trend analysis, for example, a review of primary contributor and failure category printouts will reveal anomalies. These anomalies will then be subjected to detailed study to determine the actual effect of the problem and recommended corrective actions. Statistical practical procedures, such as significant-difference tests, trend-of-regression analyses, and contingency table analyses, will be applied to determine whether a real problem exists. The significance of problems will be evaluated by comparing the current failure rate with expected failure rates. The latter will be based on predicted and historical values. If a problem is identified, a Failure/Trend Alert will be prepared and forwarded to the NAVSEA CIWS maintenance manager. The emphasis in all data analyses will be on the clear and useful presentation of data for engineering management.

CHAPTER FOUR

PROGRAM RESOURCES

4.1 INTRODUCTION

The CIWS FDAC will be managed and executed within the framework defined by the Navy for program management planning, programming, and budgeting. The FDAC will be a subset of the overall CIWS Program, conforming with the provisions of the Navy Programming Manual and NAVMAT/NAVSEA guidance.

The CIWS FDAC will be evolving over the next several years. It is important to the success of the CIWS Program that the FDAC be initiated in conjunction with the fleet installations. As the installations grow, all activities dedicated to achieving the program objectives should be established and functional. Early recognition of the funding, personnel, and material requirements of these evolutionary developments is essential, so that timely budgetary requests can be included in the Navy's annual Program Objectives Memorandum (POM). This chapter describes the preliminary procedures used to request and manage FDAC resources. These procedures will be modified as necessary during implementation of the CIWS FDAC.

4.2 RESOURCE ACQUISITION

The resources necessary to support operation of a CIWS FDAC will be provided by NAVSEA. Acquisition of necessary resources is the responsibility of the CIWS Program Office (NAVSEA-62YD) during the CIWS development phase and will transition to the CIWS maintenance manager (NAVSEA-62YGE) for the implementation phase of this program. The CIWS maintenance manager will develop the FDAC resource requirements and include them in the

annual POM submissions forwarded to COMNAVSEA via NAVSEA-62YG and NAVSEA-01.

To facilitate the development of the NAVSEA-62YGE-level POM and budget requirements for the FDAC, the FDAC director will annually submit to NAVSEA-62YGE a fiscal year budget and a five-year fiscal forecast. Specific guidance on the required submission data and exhibits and the procedures to be followed will be provided to the FDAC at the time the fiscal information is requested. POM budget submissions by the FDAC will identify the resources required to support the operation of the FDAC and will address the following areas, at a minimum:

- Hardware acquisition and maintenance
- Software (data base) acquisition and maintenance
- Personnel support (operators and analysts)

4.3 RESOURCE ADMINISTRATION

Once resources have been allocated to the FDAC, measures must be established to ensure that these resources are used to attain the objectives of the CIWS Program. The following subsections describe the resource administration procedures established to manage the funds, personnel, and material allocated to the FDAC within the CIWS Program to ensure that program resources are used in an efficient manner.

4.3.1 Program Funds

Appropriate standard financial control documents will be prepared and maintained by the CIWS Program Office. Information concerning the specific financial data required from program-level failure data analysis supporting activities (e.g., NOSL, WQEC, and contractors) will be provided at the time the support request or contract is issued.

4.3.2 Program Personnel

Organization of the FDAC depends on a few well trained personnel for continuous collection, analysis, and dissemination of failure data for the CIWS. To assist assigned personnel to maintain or increase their utility

to the program and to ensure that personnel are used to the best advantage, it is important that some actions be taken.

To provide accurate and timely failure data reports, the personnel involved must be familiar with the system and analysis techniques employed. It is incumbent upon the FDAC director to ensure that trained personnel are available and continuously employed. Program training should be continuously assessed and included in funding requests, as required. Training will provide for increased flexibility for site operation, while ensuring a good product output.

To ensure availability of both the quantity and quality of personnel necessary to operate the FDAC, the program manager will be apprised of FDAC requirements by the FDAC director via the CIWS maintenance manager (NAVSEA-62YGE). At a minimum, this information will consist of the type of personnel required and the time each person spends conducting various activities within the FDAC. In addition, recommended changes to man-years of effort or fields of expertise of FDAC personnel will be submitted in an annual report, together with funding requirements.

4.3.3 Program Material

The material requirements for the FDAC will be minimized if the activity designated as the FDAC already has computer facilities that can absorb the analysis requirements of the CIWS. Material requirements will then be limited to routine office supplies needed for FDAC administration. There will also be a nominal requirement to support computer operations and report dissemination. None of these requirements will require substantial new funding, but hardware and software additions may be required to augment the computer facility to support data analyses once all CIWSs are installed and operational. These requirements must be planned in advance by the FDAC director and addressed in the annual POM submission and five-year fiscal forecasts.

4.3.4 Other FDAC Support

The FDAC may be required to utilize resources outside the normal control of the CIWS Program Office. The general administrative procedures

dealing with the control of these outside sources are already well defined by Navy instructions, and the CIWS Program will conform to these requirements with regard to FDAC support. The major types of program support fall within the areas of computer hardware and software services and analysis support. Computer hardware and software services could pertain to either the maintenance of existing equipment and programming or the expansion of capability in these areas. Analysis support may be used by the FDAC to assist in either very specific problems or general data assessment.

APPENDIX

ABBREVIATIONS AND ACRONYMS

This appendix lists abbreviations and acronyms commonly used in this report.

ADP - Automatic Data Processing
APL - Allowance Parts List

CASREP - Casualty Report
CHNAVMAT - Chief of Naval Material
CIWS - Close-In Weapon System
CNO - Chief of Naval Operations
COMNAVSEA - Commanding Officer, Naval Sea Systems Command
CONAR - Commanding Officer's Narrative Report
CRT - Cathode Ray Tube

DAR - Data Analysis Report
DCAP - Deficiency Corrective Action Program
DOA - Designated Overhaul Activity

ECP - Engineering Change Proposal
EIC - Equipment Index Code
ES - Engineering Specialist

FDAC - Failure Data Analysis Center
FLTAC - Fleet Analysis Center
FMSO - Fleet Material Support Office

GD - General Dynamics (Pomona)
GWSRP - Gun Weapon System Replacement Program

HM&E - Hull, Mechanical, and Electrical

IDLMF - Intermediate Depot-Level Maintenance Facility
ISEA - In-Service Engineering Agent

MCR - Material Condition Review
MDS - Maintenance Data System
MIS - Management Information System
MMRS - Maintenance Management Reporting System
MSOD - Maintenance Support Office Department
MTBCM - Mean Time Between Corrective Maintenance

MTTR - Mean Time to Repair

NAVMAT - Navy Material Command
NAVORD - Naval Ordnance Systems Command
NAVSEA - Naval Sea Systems Command
NAVSEACEN - Naval Sea Support Center
NAVSUP - Naval Supply Systems Center
NOS - Naval Ordnance Station
NOSIH - Naval Ordnance Station, Indian Head (Maryland)
NOSL - Naval Ordnance Station, Louisville (Kentucky)
NSN - National Stock Number

OPNAV - Office of the Chief of Naval Operations
OrdAlt - Ordnance Alteration

POM - Program Objectives Memorandum

RMA - Reliability, Maintainability, and Availability

SECAS - Ship Equipment Configuration Accounting System
SPCC - Ships Parts Control Center

UIC - Unit Identification Code

WQEC - Weapons Quality Evaluation Center

2K - Maintenance Action Form (OPNAV 4790/2K)

3-M - Maintenance and Material Management

APPENDIX C

PREPARATION OF TECHNICAL REPAIR STANDARDS FOR CLOSE-IN WEAPON SYSTEM (CIWS) REPAIRABLLS

The Navy's Designated Overhaul Activity (DOA) is being developed to repair and refabricate CIWS modules, as necessary, during the CIWS life cycle. The technical specification providing guidance for the preparation of CIWS technical repair standards (TRSs) is presented in this appendix.

TECHNICAL SPECIFICATION

PREPARATION OF TECHNICAL REPAIR STANDARDS FOR CLOSE-IN WEAPON SYSTEM (CIWS) REPAIRABLES

November 1980

Prepared for

Director, Gun System Engineering Division
Naval Ordnance Station
Indian Head, Maryland

under Contract N00174-80-C-0241

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FOREWORD

This specification is the result of work performed by ARINC Research Corporation for the Naval Ordnance Station, Indian Head, Maryland (NOSIH) under Task 4 of Contract N00174-80-C-0241. The purpose of this task was to develop a Technical Repair Standard (TRS) specification tailored to satisfy the requirements of Navy in-house (organic) repair/testing of circuit card assemblies (CCAs) and modules for the Close-In Weapon System (CIWS) PHALANX Mk 15.

This Technical Specification provides guidance for producing Technical Repair Standards describing the minimum requirements for acceptable organic repair and refurbishment of CCAs and modules installed in the CIWS. The procedures described herein were adapted from those contained in existing Department of Defense (DoD) documentation for the preparation of Technical Repair Standards and Overhaul/Repair Standards.

ABSTRACT

A Designated Overhaul Activity (DOA) is being developed to repair and refabricate Close-In Weapon System (CIWS) PHALANX Mk 15 modules as necessary during the CIWS life cycle. Technical Repair Standards (TRSs) will be utilized to ensure all CIWS repairs and restorations meet minimum acceptable standards. This technical specification provides guidance for the preparation of TRSs to be used exclusively for the organic repair of CIWS (CCAs) and modules. It documents the format and minimum requirements for a TRS.

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GLOSSARY

APL	Allowance Parts List
ASSUR	Assurance
BUWEPS	Bureau of Naval Weapons
CCA	Circuit Card Assembly
CEN	Center
CID	Component Identification Designation
CIWS	Close-In Weapon System
COG	Cognizant
DOA	Designated Overhaul Activity
DoD	Department of Defense
DWG	Drawing
EA	Engineering Agent
FSCM	Federal Supply Code for Manufacturers
ICP	Inventory Control Point
INSP	Inspector
INT	Initial
ISEA	In-Service Engineering Agent
MFG	Manufacturer
MIL	Military
NAVORD	Naval Ordnance Systems Command
NAVSEA	Naval Sea Systems Command
NAVSHIPS	Naval Ships Systems Command
NO	Number
NOSIH	Naval Ordnance Station, Indian Head
NSN	National Stock Number
OD	Ordnance Document
OP	Ordnance Publication
OS	Ordnance Standard

GLOSSARY (continued)

PARA	Paragraph
PC	Piece
QA	Quality Assurance
QATIP	Quality Assurance Test and Inspection Plan
QTY	Quantity
QUAL	Quality
REF	Reference
SER	Serial
STD	Standard
STRS	Supplementary Technical - Maintenance Overhaul Repair Standard
SUP	Supervisor
TIDRR	Traveler and Inspection/Discrepancy/Repair Record
TRS	Technical Repair Standard

TECHNICAL SPECIFICATION

PREPARATION OF TECHNICAL REPAIR STANDARDS FOR
CLOSE-IN WEAPON SYSTEM (CIWS) REPAIRABLES

1. SCOPE

1.1 This specification defines the CIWS Program requirements for the preparation of Technical Repair Standards (TRSs). The specification is written to provide adequate instructions for the preparation of TRSs to the extent that each TRS and associated Quality Assurance Test and Inspection Plans (QATIPs) shall stress quality and workmanship standards in the accomplishment of overhaul and repair to produce products which meet designed performance requirements.

1.2 Each TRS shall be prepared for use by the appropriate levels of maintenance personnel to be engaged in the major repair, rebuilding, and restoration of systems, equipments, modules, or circuit card assemblies.

1.3 The TRS shall supplement the technical maintenance part of the technical manual for the item and should provide all necessary information required to rebuild or restore the item to a ready-for-issue condition. The TRS will supplement data published in Ordnance Publications (OPs) and Ordnance Documents (ODs) to provide the more extensive and detailed technical data necessary for the performance of required maintenance.

1.3.1 This specification combines, amplifies, and modifies the requirements of MIL-STD-1604 (OS) and MIL-T-24424 (SHIPS) for the preparation of TRSs.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect at time of preparation of a TRS form a part of this specification to the extent specified herein:

STANDARDS

Military

MIL-STD-1604 (OS)	Technical and Maintenance Overhaul and Repair Standards, Preparation of

MIL-STD-12C	Abbreviation for Use on Drawings, Specifications, Standards and in Technical Documents
MIL-STD-480	Configuration Control - Engineering Changes, Deviations, and Waivers
MIL-STD-481	Configuration Control - Engineering Changes, Deviations, and Waivers (Short Form)

SPECIFICATIONS

Military

MIL-M-15071	Manuals, Technical Equipments, and Systems Content Requirements for
MIL-T-24424 (SHIPS)	Technical/Maintenance Overhaul and Repair Standards
MIL-Q-9858	Quality Program Requirements

2.2 Other Publications. The following documents are used to prepare Technical Repair Standards.

a. Technical Manuals (Ordnance Publications, Ordnance Documents)

b. Ordnance Requirements

c. Military Specifications

d. Military Standards

e. Uniform Methods and Standards

f. Allowance Parts Lists

g. Military Drawings

h. Manufacturer's Drawings

(Copies of specifications, standards, drawings, and publications required by suppliers, if used in conjunction with specific procurement functions, should be obtained from the procuring activity or as directed by the Contracting Officer.)

3. REQUIREMENTS

3.1 Level of Writing. The text of the TRS shall be specific, concise, and clearly worded to be readily understandable by inspectors and overhauling personnel who have had previous working experience with the system, equipment, component, or similar items. Language use levels are specified in MIL-M-15071.

3.1.1 Illustrations. Illustrations consist of tables, line drawings, or pictorial art. Illustrations will be utilized to improve clarity or reduce volume of written text. Tables will be labeled: Table 1; Table 2.

Other illustrations will be labeled: Figure 1; Figure 2. Full page tables and illustrations shall be arranged so that the reader has to make only one clockwise turn to view it properly.

3.1.2 Location of Illustrations. Illustrations shall, where feasible, appear on the same page of text as the action depicted.

3.2 Content and Format. The TRS shall present material in the following format:

Cover Sheet

Change Sheet

References

Purpose

Scope

Section 1. Overhaul/Repair Work Requirements

1.1 General

1.2 Examinations, Tests, and Corrective Actions

1.3 Planned Overhaul/Repair Maintenance

1.4 Reassembly and Grooming

1.5 Final Acceptance Tests

Section 2. Overhaul/Repair Record Requirements

Appendixes

Enclosures

3.2.1 Cover Sheet. The cover sheet shall be as shown in Figure 1.* The abbreviated title shall be presented in accordance with MIL-STD-12C.

3.2.2 Change Sheet. The change sheet shall be shown in Figure 2.

3.2.3 References. References shall be identified by letters [e.g., (a), (b), (c), etc.] in the format shown in Figure 3. The references shall be presented in groups and will be ordered within each group corresponding to their appearance in the text. The groups are as follows:

1. MIL-Standards, Handbooks, and Procedures
2. MIL-Specifications
3. Technical Manual
4. NAVSEA (NAVORD) and Manufacturer Drawings
5. Related TRS

*All figures follow Section 6.

3.2.3.1 In the text of the TRS, references shall be referred to by number and letter, i.e., reference 1(a), 2(a), 3(a), etc. The page and paragraph shall be called out in the text of the TRS when applicable.

3.2.3.2 The number of references shall be kept to a minimum and should be used to reduce the complexity or volume of the TRS as appropriate.

3.2.3.3 The references used in the TRS shall be government-approved documents, i.e., MIL-Specifications, Technical Manuals, etc. Where commercial documents are the only suitable reference material available, they shall be used for general information or procedures subject to the concurrence of the approval authority.

3.2.4 Purpose. The TRS purpose shall appear as a distinct section and shall mark the beginning of the general text of the TRS as shown in Figure 3, page 18.

3.2.5 Scope. The scope shall appear in the section immediately following the purpose. (See Figure 3, page 18.)

3.2.6 Section 1 Overhaul/Repair Work Requirements. Five subsections (1.1 through 1.5 -- see Figure 3, pages 18 through 20) shall be included as follows:

(a) 1.1 General. This section should address general requirements concerning (1) the satisfactory overhaul/repair of the system, equipment, or component in accordance with stated post-overhaul requirements, (2) establishment of minimum quality assurance provisions, (3) configuration control, and (4) the precedence of the TRS relative to other documents.

(b) 1.2 Examinations, Tests, and Corrective Actions. The following maintenance requirements and actions shall be included in paragraphs under this heading:

(1) Specify the examinations and tests required during repair and refurbishment to determine the need for work in addition to that prescribed by planned overhaul maintenance. For each examination and test, describe the method of accomplishment, and specify required measurements. Acceptance criteria (dimensions, clearances, voltages, etc.) shall be specified in the post-overhaul/repair performance requirements.

(2) Specify replacement, repair, or refurbishment actions acceptable to correct deficiencies found during these examinations and tests. Where corrective actions must be accomplished and certified in accordance with a specific procedure, the TRS shall invoke applicable procedures.

(3) Specify the method for recording: test results, inspection and examination results, and corrective actions taken.

(c) 1.3 Planned Overhaul/Repair Maintenance. Paragraphs under this section shall:

(1) Specify planned overhaul work requirements, including cleaning, refurbishing, and replacement of parts. Planned overhaul or repair work requirements identify the minimum maintenance requirements for the system, equipment, or component regardless of condition. Such requirements are not dependent on data obtained from pre-overhaul/repair examination and tests. These requirements should be predetermined standards resulting from the application of engineering judgment and consideration of the following:

a. Review of design

b. Service of the item

c. Past experience

d. Performance requirements

e. Trade-off in cost and reliability between piece-part replacement or refurbishment

(2) Describe the instructions for disassembling and isolating the unit from other units. They shall also provide instructions for disassembling the assemblies and subassemblies from the unit when applicable. When the instructions provided in reference documents are adequate and correct, the document shall be referenced; otherwise the correct procedures shall be specified in the TRS. Where examinations, inspections, tests, and quality assurance (QA) checks must be performed prior to or during disassembly, the TRS shall so specify.

(3) Describe the Planned Overhaul/Repair Material List. The Planned Overhaul/Repair Material List shall contain as a minimum the Allowance Parts List (APL) number, part name, Naval Sea Systems Command (NAVSEA) (NAVORD, NAVSHIPS, BUWEPS, etc.) drawing number (or manufacturing drawing numbers when NAVSEA drawing number is not assigned), piece number, manufacturer part number, quantity, and national stock number for each part (see Figure 4). It shall list those parts which are to be replaced during overhaul of the unit regardless of condition. The parts to be included in the Planned Overhaul/Repair Material List will be dependent on the repair experience of the TRS preparer and shall be determined by considering those parts which:

a. Are damaged or destroyed during disassembly.

b. Are subject to wear.

c. Are judged to be more economical to replace than to inspect.

d. Have a history of high usage.

The parts for units, modules, or assemblies shall normally be listed in the same order as they appear in the assembly drawing list of

materials. Those parts which comprise a subassembly shall be grouped together even if not consecutive piece numbers. Planned Overhaul/Repair Material Lists will appear in an appendix.

(4) Describe the Contingency Material List. The Contingency Material List shall contain as a minimum the APL number, part name, NAVSEA (NAVORD, NAVSHIPS, BUWEPS, etc.) drawing number (or manufacturer drawing number when NAVSEA drawing number not assigned), piece number, manufacturer part number, quantity, and national stock number (see Figure 5). This list shall serve as a guide for material that may be needed when the unit is overhauled. It shall list parts which may require replacement during the overhaul of the unit. It is not intended to make the procurement of such material mandatory. Contingency material lists will appear in an appendix.

(5) Specify items to be inspected and acceptance criteria. Items which are subject to wear, corrosion, erosion, and aging shall be examined and tested if such wear or other deterioration would ultimately result in failure to meet performance specifications. Specific acceptance criteria shall be furnished in the TRS for each such item. The criteria are to be based on actual wear, corrosion, erosion, and aging data when such data are available. These criteria are to be based on assuring satisfactory performance for the planned period of service between refurbishments for the particular item. The criteria will in many instances be a matter of engineering judgment when wear or deterioration rates have not been established for shipboard operating conditions.

(5.1) Where specific parts are mentioned, the part number [National Stock Number (NSN), Cognizance (COG), Federal Supply Code for Manufacturing (FSCM), part number, or NAVSEA part number as applicable], and applicable reference document shall be noted in the text of the TRS to minimize any possibility of misunderstanding.

(5.2) When the technical manual includes charts of clearances and tolerances, this information may be used as a starting point in specifying allowable wear. The following list illustrates typical examples of items and applicable criteria of acceptability:

(a) Bushings or bearings and mating shafts. Clearances or dimensions.

(b) Pump wear rings or rotors. Clearances or dimensions.

(c) Thrust bearings. End play.

(d) Gear trains. Backlash, contact pattern, and alignment.

(e) Pressure containing parts. Wall thickness (thinnest area, erosion path, or both) and leakage rate.

(f) Couplings and shafts. Alignment and clearance.

(g) Piping, valves, fittings. Thickness and leakage rate.

(h) Operating mechanisms. Backlash or play.

(i) Cylinders and pistons. Clearances, diameters, and leakage rate.

(j) Valves, disks, and seats. Dimensions for important parts, seat angles, seat rings, ball diameters.

(k) Electrical wire. Insulation resistance.

(l) Switches, transformers, relays, and other electronic or electrical components. Electrical and mechanical characteristics.

(d) 1.4 Reassembly and Grooming. Paragraphs under this section shall:

(1) Provide all necessary reassembly instructions and specify required hold points for a QA inspector to accomplish inspections as delineated by QATIPs. When the instructions provided in a technical document are adequate and correct, that document shall be referenced; otherwise the correct instructions shall be stated in the TRS.

(2) Specify grooming which is required before or during post-overhaul tests and reference the guiding technical manuals.

(3) Specify that, upon completion of grooming, the overhaul/repair activity will place suitable data on the body of the part which will provide, in legible form, the following information: part number, serial number (if applicable), overhaul/repair activity identification, shelf-life expiration, and the date of overhaul/repair. This data shall be suitably affixed on the part or accompany it, depending upon part size, use, and composition.

(e) 1.5 Final Acceptance Tests. Paragraphs under this heading shall:

(1) Specify the system, equipment, or component performance requirements.

(2) Specify the examinations and tests, including required test equipment and documentation, required to assure that the item satisfies the above performance requirements.

(3) Specify the method of recording test data.

3.2.7 Section 2 Overhaul/Repair Record Requirements

3.2.7.1 Data Purpose. The purpose to be served by the overhaul/repair record shall be to:

(a) Provide a permanent record of the overhaul/repair test and inspection.

(b) Define items and areas requiring work.

(c) Provide data for future overhaul planning.

(d) Serve as a basis for determining the adequacy of the TRS for use on subsequent overhauls or refurbishments.

(e) Serve as a library of information which can support ADP reporting systems and engineering analysis as required.

3.2.7.2 Data Record. To achieve the purpose specified in 3.2.7.1 the TRS shall require specific data to be recorded. Fulfillment of the data requirements will be accomplished through preparation of a Traveler and Inspection/Discrepancy/Repair Report (TIDRR), in accordance with the preparation instructions and TIDRR content shown in Figure 6 and the example format shown in Figure 7. The TRS originator should combine the contents of Figures 6 and 7 from this specification into a single appendix within the TRS. The TIDRR satisfies two data requirements; first, to record the movement of the item from DOA receipt through the overhaul process to issue status and second, to record all discrepancies and actions accomplished during the overhaul process.

3.2.8 Appendixes. Appendixes will be used to separate relatively bulky information from the body of the TRS when such separation will increase the clarity of the overall TRS. Appendixes shall be identified by capital letters, e.g., A, B, C, etc. The following are examples of material that should be placed in appendixes:

(a) Planned Overhaul/Repair Material List

(b) Contingency Material List

(c) Traveler and Inspection/Discrepancy/Repair Record (TIDRR)

3.2.9 Enclosures. Enclosures may be used to include closely related material which is not an inherent part of the TRS. The enclosures, identified in full, shall be listed by numbers, e.g., (1), (2), and (3) in the order that they are mentioned in the text. Appended supplementary technical-maintenance overhaul and repair standards should appear as enclosures.

3.2.10 Security Classification. The security requirements of a TRS shall be established by the approving activity. As a minimum these requirements as specified in Security Classification in MIL-STD-1604 (OS) shall apply.

3.4 Notes, Cautions, and Warnings. Notes, cautions, and warnings shall be used to emphasize any condition potentially hazardous to personnel or equipment to highlight an important instruction.

a. NOTE

An informative sentence or paragraph used where necessary to highlight an examining or testing procedure, or a condition. Notes may, as appropriate, precede or follow the procedure.

b.

CAUTION

A sentence or paragraph preceding a disassembly, examination, or test paragraph which must be followed or risk damage to or destruction of the unit. Cautions are to be separated from the text by blocking.

c.

WARNING

A sentence or paragraph preceding an examining or testing procedure or practice which must be observed or risk either loss of life or injury to personnel. Warnings are to be separated from the text by blocking.

3.5 Applicability of TRS

3.5.1 Similar Items. When an existing TRS for an item is found to be entirely applicable to a similar item, the TRS applicability will be extended by NAVSEA-62YG to cover both items. The cover sheet shall be modified accordingly.

3.5.2 Differences. When an existing TRS for an item is found to be applicable to a similar item, except for minor differences, the TRS may be supplemented to cover the differences. A supplementary TRS (STRS) will be appended to the existing TRS. The STRS will describe all differing information in accordance with the requirements of paragraph 3.2 such that it is coherent and does not repeat data in the existing TRS. When STRSs are appended to an existing TRS, the cover sheet of the existing TRS will accurately reflect the items covered by the appended STRSs.

3.6 Production. Acceptable production details are set forth in this specification. Alternate methods will be considered by the procuring agency if equivalent performance and durability are provided. The copy shall be such that clear, readable reproductions may be obtained. Any method of duplication which will provide the necessary quantity of black legible copies will be acceptable.

3.6.1 Typography.

3.6.1.1 General Typing Instructions. General typing instructions are as follows:

(a) Use elite type size, 12 characters per inch.

(b) Top, bottom, right, and left margins shall be approximately one inch.

3.6.1.2 Legend. The TRS document number shall appear in the upper right corner of the first page of the text and shall alternate upper left corner and upper right corner on succeeding pages.

3.6.1.3 Title. The title shall be typed in capital letters on the first page of the text only, underlined and located at the left margin two lines below the legend.

3.6.1.4 Paragraph numbering. Decimal paragraph and subparagraph numbering shall be used. All paragraph numbers shall be indented five spaces from the left margin.

3.6.1.5 Notes, cautions, and warnings shall be inserted in the body of the text by indenting approximately one inch from both the right and left margins. Cautions and warnings shall be boxed as noted in 3.4.

3.6.1.6 Page Numbering. Pages shall be numbered consecutively, in the center, approximately one-half inch from the bottom of the page.

3.6.1.7 Appendixes and Enclosures. The following identification applies to both appendixes and enclosures.

(a) The first page shall carry the identification in the center of the page, on the same line as the legend.

(b) The legend will be carried on all pages.

(c) On pages other than the first, the identification will be carried in the lower center for appendixes or lower right-hand corner for enclosures, as follows:

Letter - Number	Enclosure ( )
A-2	Sheet __ of __

3.6.2 Paper Stock. Any good quality paper stock (8-1/2 inches by 11 inches) which is suitable for the intended method of reproduction may be used. Fold-out sheets may be used when necessary.

3.6.3 Assembling. TRSs shall be prepared in loose-leaf form and shall be stapled.

3.7 Revisions

3.7.1 Changes. Information amending, correcting, or modifying TRSs shall be issued as a permanent change. Such permanent changes shall be produced in accordance with the following change control procedures.

3.7.1.1 TRS Change Control Procedures. The purpose of the change control procedures is to provide a standard, systematic method for documenting and controlling major, minor, and complete changes (revisions) to the TRSs. To effect a change, the recommended change(s) shall be originated by (1) the activity responsible for TRS preparation, (2) the designated overhaul activity, or (3) the NAVSEA technical code, Engineering Agent (EA)/In-Service Engineering Agent (ISEA), and shall be submitted to the cognizant EA via the most expeditious means of communication (e.g., telephone, message, letter) commensurate with the urgency of the change. Immediate authorization to effect pen-and-ink changes to the TRS may be granted by the EA by return communications; however, all telephone requests, approvals, and disapprovals must be confirmed by message. All change information must be entered on the change sheet (see Figure 2). The change sheet of each TRS must reflect the change action and number. The change (revision) number must be placed in the lower left-hand corner of the affected page(s).

3.7.1.2 Minor Changes. Changes in this category are defined as those changes in TRS wording or work process description which do not affect the test specification, do not require immediate incorporation, and can be accomplished on a routine basis. Minor changes shall be prepared in final format and forwarded to the EA for approval and change number assignment prior to incorporation. A new cover sheet bearing the next change number as a part of the document number shall be issued.

3.7.1.3 Major Changes. Changes in this category are those which must be made to an existing TRS in order to perform production overhaul/repair processing, to correct conditions adverse to effective operations, or to perform acceptance testing in accordance with specifications. If the change involves a major revision in one or more pages, new pages incorporating the change data into the TRS body shall be prepared together with a new cover sheet bearing the next change number. Changes in this category will require the approval of NAVSEA or the designated EA prior to use.

3.7.1.4 Complete Change. A complete revision of the TRS is required if (1) a single change affects more than 25 percent of the pages, or (2) after 15 changes have been made to the TRS. The TRS shall be reprinted in its entirety, assigned the next revision letter as part of the document number, and forwarded to the EA for review and approval prior to use.

3.8 TRS Document Number. As a technical publication, each TRS will be assigned an identifying number which correlates with the TRS numbering system.

3.8.1 TRS Number Assignment. NAVSEA or a designated representative will assign the document numbers for each TRS and Supplementary Technical-Maintenance Overhaul Repair Standard (STRS), and will monitor change number assignments.

3.8.2 TRS Numbering System. The TRS number should consist of a minimum of two groups of alphanumerics. The first group should identify the category of hardware covered by the TRS. The second group should be used for more specific identification of the specific item of hardware or as a means of serializing TRSs within the same initial category. Section 4.6 of MIL-STD-1604 (OS) provides examples of potential numbering schemes.

3.9 Engineering Judgment Record. A concise formal engineering judgment record shall be provided with each TRS which is submitted for review or approval. This record shall be provided with each TRS but shall not form part of the TRS. This record shall contain the engineering analyses and reasoning in support of all tolerances and limits included in the standard. Each item discussed shall be identified with the associated paragraph number or number of the TRS. NAVSEA-62YG shall retain this record for reference and information.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection. Unless otherwise specified in the procurement order, the preparing activity is responsible for the performance of all requirements specified herein. The preparing activity may use his own or any other facilities suitable for the performance of the requirements specified herein, unless disapproved by NAVSEASYSCOM. NAVSEASYSCOM reserves the right to perform any of the inspections set forth in this specification when such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Quality Program Requirements. The preparing activity shall maintain a quality program acceptable to NAVSEASYSCOM. The quality program shall be in conformance to the requirements of MIL-Q-9858 and this specification.

4.2.1 The quality program shall be of sufficient depth to assure that adequate and accurate requirements and procedures are presented in TRSs and that TRSs being prepared and furnished are in accordance with the requirements of this specification. The quality program shall take into account such areas of concern as the following:

a. Definition of authority, function, and duties of those responsible for preparation and inspection of the TRS.

b. Designation of qualified personnel for the preparation and inspection of the TRS.

c. Development, issuance, maintenance, and distribution of procedures for preparation and inspection of the TRS.

d. Coordination with design and production activities to ensure the latest technical data, examining and testing procedures, and references are used in the preparation of the TRS, and revisions to the TRS are made concurrent with revisions to the unit design.

e. Formal detailed review to ensure the adequacy of the instructions in the TRS for specific examination and test criteria for the unit, and compliance with this specification for both content and production.

f. Establishment of validation procedures, inspection points, inspection criteria, and the proofing of these designated inspections to determine adequacy and accuracy.

4.2.2 NAVSEASYSCOM reserves the right to make additions, refinements, or changes to the quality program where evidence indicates the need for such action, and reserves the right to perform quality assurance audits.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be as specified in paragraph 4.9, MIL-STD-1604 (OS).

6. NOTES

6.1 Ordering Data. Procurement documents should specify the following:

a. Title, number, and date of this specification

b. Quality assurance requirements (see 4.2)

6.2 Definitions. For the purpose of this standard, terms used herein are defined as follows:

a. Assembly. A number of parts or subassemblies or any combination thereof joined together to perform a specific function and capable of being disassembled.

b. Component. A composite fabricated unit, generally complete within itself, that is designed to perform a stated service when installed in its proper position.

c. Equipment. A component or components and necessary assemblies, subassemblies, and parts connected or associated together to perform an operational function.

d. Item. A nonspecific term used to denote any product, including systems, materials, parts, subassemblies, sets, accessories, etc.

e. Proofing. Proofing as used herein consists of the systematic process by which physical and functional descriptions and procedures set forth in the TRS are evaluated for technical accuracy and adequacy with respect to the performance of the functions and requirements on the actual systems, equipments, and components described in the TRS. Proofing also ensures that the TRS is in conformity with the content, inspection, and production requirements of this standard and other applicable technical specifications.

f. Subassembly. Two or more parts which form a portion of an assembly or a unit replaceable as a whole, but having a part or parts which are individually replaceable.

g. System. A combination of parts, assemblies, and sets joined together to perform a specific operational function or functions.

h. Validation. The process by which a TRS is checked for technical accuracy and adequacy by actual performance of the examining, testing, and servicing instructions on the item for which the TRS was written.

6.3 Uniform Methods and Standards. The activity preparing the TRS shall make maximum use of existing uniform methods and standards and reference them in the TRS where applicable.

6.4 TRS Review and Approval. The review and approval of TRSs shall involve the participation of both the procuring and the preparing activities. Engineering review of Technical Repair Standards may be conducted at three stages of preparation progress, viz., in-process, completion of preliminary TRS, and in its final form prior to promulgation.

6.4.1 In-Process Reviews. In-process review is the review of TRSs while in the process of preparation. The review may be performed by the cognizant Government activity or the preparing activity (originator) and may occur at any point(s) during the TRS development, as specified by the procuring activity documentation (i.e., work requests, contracts, etc.).

6.4.2 Review of Preliminary TRSs. Preliminary TRS review consists of review for technical content and format when the TRS has been completed in its initial form. The review is conducted by cognizant Government personnel prior to TRS submission in final form. It is envisioned that the ISEA will normally be tasked from NAVSEASYSCOM to conduct this review.

6.4.3 Approval and Acceptance. Review of the TRS in its final form for approval and acceptance consists of careful examination of the TRS format and content for accuracy and adequacy. This review will normally be conducted in conjunction with and following satisfactory performance of proofing (see 6.5 below). This function is a NAVSEA responsibility of the CIWS maintenance manager but may be delegated to the appropriate maintenance engineering activity or agent.

6.5 Proofing. Completed TRSs should be proofed at the TRS originating activity prior to formal approval as directed by the procurement document. The purpose of proofing is to assure that the TRS is complete, accurate, workable, and compatible with other processing documentation and conforms to the content, inspection, and production requirements of this standard and other applicable technical document specifications. When the TRS originator is also the designated overhaul/repair activity for the item, proofing may be conducted during validation. Proofing will be accomplished through detailed application of TRS provisions in the actual performance of examining, testing, and servicing instructions against or on the physical system, equipment, or component described in the TRS. The proofing demonstration shall include inspection, disassembly, assembly, maintenance, troubleshooting, testing, and other work specified in the TRS for the hardware to the extent technically practical. Written information and drawings in each TRS shall be compared against actual equipment in all details. Procedures that would damage the hardware or that would incur extraordinary costs will be demonstrated by review of applicable drawings. Changes found necessary during proofing will be incorporated in the TRS reproofed prior to formal approval and distribution. Proofing will be performed by cognizant NAVSEASYSCOM representatives and TRS originator personnel. Satisfactory accomplishment of the proofing is a prerequisite to the CIWS maintenance manager's (NAVSEA-62YG) final approval of the TRS.

TRS NO. _____

CANCELS _____

TECHNICAL REPAIR STANDARD

TITLE: _____

ABBR. TITLE: _____

CID/APL NO.: _____

APPLICABLE NEXT HIGHER LEVEL OF ASSEMBLY: _____

APPENDED SUPPLEMENTARY TRSs:

TRS NO.	NOMENCLATURE

APPROVED: _____

DATE: _____

Figure 1. TRS COVER SHEET

TRS NO. _____

CHANGE SHEET

CHANGE NUMBER	DATE	TITLE AND/OR BRIEF DESCRIPTION	SIGNATURE

Figure 2. TRS CHANGE SHEET

TRS NO. _____

TITLE OF TECHNICAL REPAIR STANDARD

References

1. MIL-STANDARDS, HANDBOOKS, AND PROCEDURES

(a)	MIL-STD-480	Configuration Control - Engineering Changes, Deviations, and Waivers
(b)	MIL-STD-481	Configuration Control - Engineering Changes, Deviations, and Waivers (Short Form)

2.

(a)	MIL-Q-9858	Quality Program Requirements

Appendixes

A

B

C

D

Enclosures

(1)

(2)

PURPOSE

The purpose of the TRS is to provide examination, test, repair, maintenance, and performance specifications for the overhaul/repair of (List system, equipment, component, or assembly).

SCOPE

1. The TRS covers the requirements for depot-level maintenance to be performed by qualified depot-level mechanics to return the item to an operational condition.

2. The item affected and the extent of overhaul/maintenance which are performed by repair personnel are listed as follows:

ITEM	NSN NO.	MAINTENANCE REQUIREMENT

Figure 3. TRS FORMAT

3. The unit physical boundaries of this technical repair standard are the (List physical boundaries).

4. The following TRSs contain the overhaul/maintenance requirements for the sub-items/assemblies which comprise the subject item of this TRS.

SECTION 1 OVERHAUL/REPAIR WORK REQUIREMENTS

1.1 General

1.1.1 The requirements of the TRS shall govern if a conflict exists between the manufacturer's original design requirements and this TRS.

1.1.2 The overhaul/repair activity is responsible for overhauling/repairing the system, equipment, or component such that it satisfies the post-overhaul/repair requirements specified in paragraph 1.5 (Final Acceptance Tests) to assure satisfactory service from the item between maintenance cycles without requiring more than routine maintenance. The overhaul activity quality assurance shall meet the requirements of reference 2 (a).

1.1.3 Component configuration changes shall not be made when such changes will prohibit the use of approved parts for the item involved unless required engineering changes, waivers, or deviations have been obtained in accordance with the provisions of references 1 (a) or 1 (b), as applicable.

1.1.4 Unless part replacement is specified, parts examined by this TRS that do not meet acceptance criteria may be either repaired in accordance with approved procedures or replaced.

1.1.5 Parts listed in the Planned Overhaul/Repair Material List, Appendix A, are based on failure history and cost-to-repair/replace and shall be renewed regardless of their condition. This material shall be on hand to accomplish the planned overhaul maintenance in accordance with the TRS. When Planned Overhaul/Repair Material is not available original parts shall be refurbished or manufactured to original specifications.

1.1.6 Parts on the Contingency Material List, Appendix B, do not include (a) anticipated high usage, low cost consumables such as nuts, bolts, studs, screws, etc., (b) items whose limited usage seldom requires replacement, or (c) items for which replacement parts are not procured because it is more economically feasible either to refurbish the defective part or to replace the major unit. The Contingency Material List is provided as a guide for material that may be needed when the unit is overhauled. Procurement of items on the list should be based on the experience of the overhauling activity.

Figure 3. (continued)

1.2 Examinations, Tests, and Corrective Actions

1.2.1 (Detailed instructions)

1.3 Planned Overhaul/Repair Maintenance

1.3.1

1.4 Reassembly and Grooming

1.4.1

1.5 Final Acceptance Tests

1.5.1

SECTION 2 OVERHAUL/REPAIR RECORD REQUIREMENTS

2.1 All examination data, test results, and maintenance actions shall be recorded in the Traveler and Inspection/Discrepancy/Repair Report, Appendix C.

2.2 All completed documents shall be filed by the overhaul activity as a permanent record of the overhaul/repair performed.

APPENDIXES

A. Planned Overhaul/Repair Material List - Those parts, based on engineering analyses, required to implement planned maintenance actions.

B. Contingency Material List - Those parts, based on engineering analyses, likely to require replacement

C. Traveler and Inspection/Discrepancy/Repair Report (TIDRR) - Contains recorded results of examinations, tests, and maintenance actions.

Figure 3. (continued)

PLANNED OVERHAUL/REPAIR MATERIAL LIST

TRS NO. _____

APL NO.	DESCRIPTION	NSN	MFG. PART NO.	QTY	NAVSEA or MFG. DWG. NO.	PC. NO.

Figure 4. PLANNED OVERHAUL/REPAIR MATERIAL LIST - APPENDIX TO TRS

CONTINGENCY MATERIAL LIST

TRS NO. _____

APL NO.	DESCRIPTION	NSN	MFG. PART NO.	QTY	NAVSEA OR MFG. DWG. NO.	PC. NO.

Figure 5. CONTINGENCY MATERIAL LIST - APPENDIX TO TRS

TRAVELER AND INSPECTION/DISCREPANCY/REPAIR REPORT (TIDRR)

(1) The TRS originator shall prepare the TIDRR outline and designate data recording requirements concurrently with TRS preparation. The TIDRR outline will be an appendix to and form part of the TRS.

(2) The quality of the TIDRR shall be sufficient to permit working copy reproduction of the TIDRR by the depot-level activity designated to perform overhaul/repair of the item covered by the TRS. A TIDRR (working copy) shall be completed for each item processed by the overhaul activity.

(3) TIDRR HEADING. This section of the format will appear immediately above the Traveler Section, see page 27. Information required in the heading is self-explanatory. The TRS originator will complete, as practical, the following heading information:

Item/Component Nomenclature

Allowance Parts List (APL Number)

Cognizance (COG) Symbol

National Stock Number (NSN) [or Federal Item Identification Number (FIIN) or Federal Supply Code for Manufacturers (FSCM) if NSN not available]

Item Part Number

System Title (system terminology including Mark/Mod designation)

Equipment Title (i.e., next higher assembly)

Inventory Control Point

The remaining blocks will be completed on reproduced (working) copies of the TIDRR by the activity performing the overhaul/repair work.

(4) TRAVELER SECTION. The Traveler Section will provide a systematic method for scheduling and tracking each item through the overhaul/repair process, and for verification that each planned processing operation is accomplished and initialed off by responsible personnel.

Figure 6. TRAVELER AND INSPECTION/DISCREPANCY/REPAIR REPORT (TIDRR) PREPARATION INSTRUCTIONS AND CONTENT - APPENDIX TO TRS

(a) The Processing Operations column shall be filled in by the TRS originator at the time of TRS preparation. The broad categories of processing operations will be based upon the detailed procedures in the TRS and will be identified and listed in a planned sequence of events to enhance the orderly movement of the item through the overhaul/repair production line. An example listing is shown herein (page 27) to illustrate representative general categories of operation. Formatting of the Traveler Section may be modified, if required, to accommodate repetitive processing steps peculiar to the procedures contained in the TRS, or repeated steps may be indicated by appropriate work sequence number assignment.

(b) DOA work center and shop code assignments are prepared on working copies by the TIDRR scheduler for the items covered by the TRS. Manhour expenditure figures will be the totals for the operation performed measured in tenths.

(c) Work processing start date represents the date of induction for the overhaul/repair and completion date represents the date when the item has been packaged and is ready for issue.

(d) Work complete and satisfactory blocks will be signed off by responsible personnel after assurance that all required work has been performed and the data record is complete.

(5) INSPECTION/DISCREPANCY REPORT

(a) Discrepancies reported by the user organization (or other survey activity) will be entered under the Reported Discrepancies column by the overhaul/repair activity on working copies of the TIDRR. Following the examinations or tests necessary to ascertain the existence of the reported discrepancy, the appropriate block, Verified or Not Verified, will be checked, the recommended action will be noted, and the inspection phase will be signed off. Verified discrepancies and those other discrepancies noted during disassembly and other receiving tests/examinations will be listed under the Discrepancies and Recommended Actions column. Corrective action will be noted when accomplished opposite the required action in the Corrective Action Taken column, and Quality Assurance Inspection indicated by QA inspectors initialing form. It is to be noted that maintenance actions to be listed herein are exclusive of planned overhaul/repair actions.

(b) Upon completion of discrepancy corrective action, the Inspection/Discrepancy Record will be signed off by the responsible supervisor and attested to by the Quality Assurance Inspector in the appropriate blocks.

Figure 6. (continued)

(6) PLANNED OVERHAUL/REPAIR ACTION RECORD

(a) Planned overhaul or repair actions required by the TRS instructions shall be indicated by the TRS originator by including the numbers of the paragraphs from the TRS in which the pertinent requirements are specified. As each of the overhaul/repair actions is accomplished by the overhaul/repair activity, the actual work performed will be briefly stated in the Action Accomplished column, and the replacement parts utilized listed on the working copy, using the identification provided in the Planned Overhaul/Material and Contingency Material Lists. Each required planned overhaul/repair action must be signed off by responsible shop supervisors and Quality Assurance Inspectors, and the completion date noted.

(b) Upon completion of planned overhaul/repair actions, the record will be certified by the responsible supervisor and attested to by the cognizant Quality Assurance Inspector in the appropriate blocks.

(7) EXAMINATIONS/TESTS RECORD

(a) The TRS originator will include the numbers of the paragraphs from the TRS in which pertinent requirements are specified, the title of the test/examination to be conducted, and the acceptance standard (limits) allowed. The overhaul/repair activity will record the actual measurements obtained for all examinations/tests including final acceptance tests required by the TRS on the TIDRR working copies. Condition or performance deficiencies noted during tests and examinations must be identified and the corrective action taken set forth in the column marked Examinations/ Test Performance.

(b) Upon completion of the examinations and test requirements, the record will be certified by the responsible supervisor and attested to by the cognizant Quality Assurance Inspector in the appropriate blocks.

(8) REMARKS. The Remarks Sheet is included to permit the overhaul/repair activity to provide comments and recommendations pertinent to (1) the condition of the item upon receipt/disassembly, (2) overhaul/repair procedures as stated in the TRS, (3) parameters utilized in examinations and tests, (4) parts rejection or discard, and (5) other comments pertinent to the overhaul/repair of the item on the working copies of the TIDRR. Each entry on the Remarks Sheet must be accompanied by the initials and code of the originator of the comment/recommendation.

(9) When filled in, this TIDRR will serve as a record of results of the examination and tests performed on the system, equipment, or component during the overhaul/repair. It will also provide verification of work performed during the overhaul/repair and certification of the system,

Figure 6. (continued)

equipment, or component condition and performance after the overhaul/repair. In addition, the TIDRR will assist in defining other items or areas requiring work, will provide the data base for future overhaul planning, will serve as the basis for determining the adequacy of the TRS for use on subsequent overhauls or refurbishments, will serve as a library of information which may be used in analyzing post-overhaul/repair malfunctions, and will serve as a data source for repairables management program information requirements.

(10) The overhaul activity will maintain a record file consisting of completed Traveler and Inspection/Discrepancy/Repair Reports for all systems, equipment, and components overhauled/repaired using TRS instructions.

Figure 6. (continued)

TIDRR TRAVELER TRS NO. _____

NOMENCLATURE	APL	COG	NSN	FSCM	PART NO.	SER. NO.

SYSTEM TITLE	EQUIPMENT TITLE	ICP SER./DATE	JOB ORDER NO.

TIDRR PREPARED BY	CODE	DATE	TIDRR APPROVED BY	CODE	DATE

TRAVELER SECTION

WORK SEQ.	PROCESSING OPERATION	WORK CEN.	SHOP CODE	SHOP SUP.	MAN-HOURS	QUAL. ASSUR.	DATE
1	PRE-OVERHAUL/REPAIR VISUAL INSPECTION						
2	CONDUCT DETAILED INS. (TE 8003)						
3	REMOVE INDICATED FAILED PARTS						
4	INSTALL NEW PARTS AS REQUIRED						
5	CONDUCT PERFORMANCE & ACCEPTANCE TESTS						
6	PREPARE FOR STORAGE/ SHIPPING						

PROCESSING		WORK COMPLETE AND SATISFACTORY			
START	COMPLETE	SUPERVISOR	CODE	QUAL. ASSURANCE	CODE

TIDRR NO. _____ PAGE _____ OF _____

Figure 7. TIDRR FORMAT - APPENDIX TO TRS

TIDRR CONTINUATION SHEET (I/D) ITEM NOMENCLATURE

INSPECTION/DISCREPANCY REPORT				
NO.	REPORTED DISCREPANCIES	RECOMMENDED ACTION		
☐ VERIFIED ☐ NOT VERIFIED		INSPECTOR	SHOP	DATE
DISCREPANCIES & RECOMMENDED ACTION TAKEN		CORRECTIVE ACTION TAKEN		QA INSP. INT.

WORK COMPLETE AND SATISFACTORY					
DATE	SUPERVISOR	CODE	DATE	QUAL. ASSURANCE	CODE

TIDRR NO. _____ ITEM SER NO. _____ PAGE _____ OF _____

Figure 7. (continued)

TIDRR CONTINUATION SHEET (O/R) ITEM NOMENCLATURE

PLANNED OVERHAUL/REPAIR ACTION RECORD					
TRS PARA NO.	ACTION ACCOMPLISHED	REPAIR PART NO. USED	SHOP SUP.	QUAL. ASSUR. INSP.	DATE
	REMOVED AND REPLACED POWER SUPPLY				

WORK COMPLETE AND SATISFACTORY					
DATE	SUPERVISOR	CODE	DATE	QUAL. ASSURANCE	CODE

TIDRR NO. _____ ITEM SER NO. _____ PAGE _____ OF _____

Figure 7. (continued)

TIDRR CONTINUATION SHEET (E/T) ITEM NOMENCLATURE

EXAMINATIONS/TESTS RECORD						
TRS PARA NO.	EXAMINATIONS/ TEST PERFORMANCE	VALUE (OR RANGE)		SHOP SUP.	QA INSP.	DATE
		SPECIFIED	OBSERVED			

WORK COMPLETE AND SATISFACTORY					
DATE	SUPERVISOR	CODE	DATE	QUAL. ASSURANCE	CODE

TIDRR NO. __________ ITEM SER NO. ____________________ PAGE ______ OF ______

Figure 7. (continued)

TIDRR CONTINUATION SHEET (R) ITEM NOMENCLATURE

REF. NO.	REMARKS	INT.	CODE

TIDRR NO. _____ ITEM SER NO. _____ PAGE _____ OF _____

Figure 7. (continued)

APPENDIX D

ABBREVIATIONS AND ACRONYMS

This appendix lists abbreviations and acronyms commonly used in the CIWS Program.

ADP - Automatic Data Processing
APL - Allowance Parts List

CASREP - Casualty Report
CCA - Circuit Card Assembly
CHNAVMAT - Chief of Naval Material
CIWS - Close-In Weapon System
CNO - Chief of Naval Operations
COMNAVSEA - Commanding Officer, Naval Sea Systems Command
CONAR - Commanding Officer's Narrative Report
COTR - Contracting Officer's Technical Representative
CRT - Cathode Ray Tube

DAR - Data Analysis Report
DCAP - Deficiency Corrective Action Program
DLMF - Depot-Level Maintenance Facility
DOA - Designated Overhaul Activity

ECP - Engineering Change Proposal
EIC - Equipment Index Code
ES - Engineering Specialist

FCS - Fire Control System
FDAC - Failure Data Analysis Center
FLTAC - Fleet Analysis Center
FMSO - Fleet Material Support Office

GD - General Dynamics (Pomona)
GWSRP - Gun Weapon System Replacement Program

HM&E - Hull, Mechanical, and Electrical

IDLMF - Intermediate Depot-Level Maintenance Facility
ISEA - In-Service Engineering Agent

MCR - Material Condition Review
MDS - Maintenance Data System
MIS - Management Information System
MMRS - Maintenance Management Reporting System

MSOD - Maintenance Support Office Department

MTBCM - Mean Time Between Corrective Maintenance

MTTR - Mean Time to Repair

NAVMAT - Navy Material Command

NAVORD - Naval Ordnance Systems Command

NAVSEA - Naval Sea Systems Command

NAVSEACEN - Naval Sea Support Center

NAVSUP - Naval Supply Systems Center

NOS - Naval Ordnance Station

NOSIH - Naval Ordnance Station, Indian Head (Maryland)

NOSL - Naval Ordnance Station, Louisville (Kentucky)

NSN - National Stock Number

OPNAV - Office of the Chief of Naval Operations

OrdAlt - Ordnance Alteration

POM - Program Objectives Memorandum

RMA - Reliability, Maintainability, and Availability

SECAS - Ship Equipment Configuration Accounting System

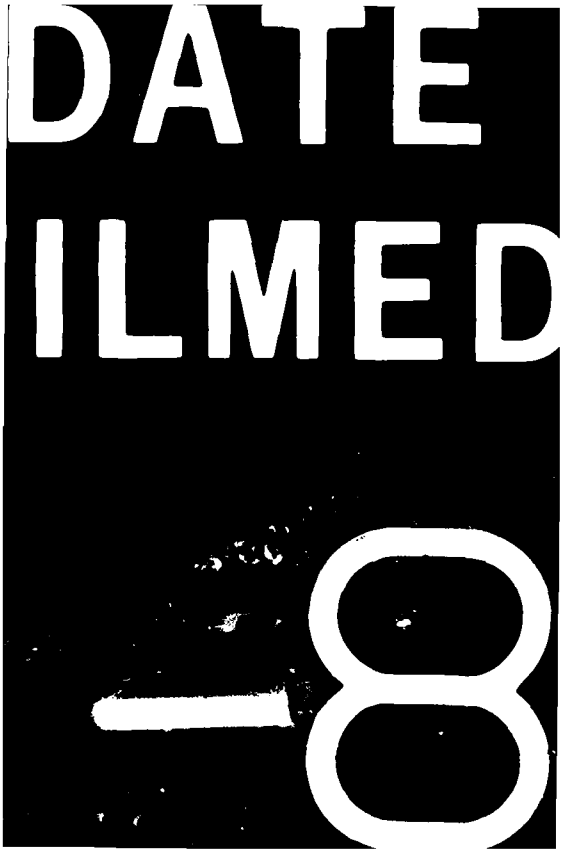
SPCC - Ships Parts Control Center

UIC - Unit Identification Code

WQEC - Weapons Quality Evaluation Center

2K - Maintenance Action Form (OPNAV 4790/2K)

3-M - Maintenance and Material Management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